STAFF WORKSHOP

BEFORE THE

CALIFORNIA ENERGY RESOURCES CONSERVATION

AND DEVELOPMENT COMMISSION

In the Matter of:	)	
	)	
2005 Building Energy	)	
Efficiency Standards	)	SIMULTANEOUS
	)	WEBCAST
Third Group of Measures	)	
Reports	)	
	)	

CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET

HEARING ROOM A

SACRAMENTO, CALIFORNIA

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Reported by:
Valorie Phillips
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I N D E X

I N D E X

P R O C E E D I N G S

10:10 a.m.

CONTRACT MANAGER ALCORN: I'd like to welcome everybody to today's workshop. My name is Bryan Alcorn. I'm the contract manager for this round of building standards. To my right is Bill Pennington, who is responsible for the technical development of the contract, and to his right is Charles Eley, who is the prior contractor to the Commission for this work.

I would like to welcome the Commissioner's Offices. I think they're listening in from their offices upstairs; I hope they are.

The purpose of this workshop today is to discuss the third group of measure analysis reports. If you look at the agenda, you can see that there are eight reports that we're going to go over today, and we're going to use the same format that we used in previous workshops; that is to say that the fundamentals of the measure analysis reports will be presented in the first 15 minutes of each presentation block, and then the remaining 30 minutes will be for questions and comments.

There is going to be one presenter, Jim

Benya. He is the last presenter of the day. He's presenting on the revised tailored method for allowed lighting power. He's going to be calling in to do his presentation remotely from Washington, DC, so at 4:15 we're going to go on ahead and stop and take his call and have his presentation this afternoon.

I want to make one announcement about the next workshop. It's scheduled for August 8th, if you could put that on your calendars. That will be the last workshop where we're looking at the measure analysis reports.

I'd like to talk about a couple of housekeeping items before we get going here. The first is that if you haven't signed in out in the lobby, please do so with a business card or just signing in so that we have a record that you're here. Also, if you could leave a copy of your business card with the recorder, and I would like to introduce her, Valorie Phillips. She's got her hand up directly across the table from me. Valorie will be waving if she can't hear your comments today.

And, by the way, we're a little shy today on microphones. You'll notice that on the table there is a tall microphone and a short microphone. The short mics go to Valorie's recorder, and the tall mics go out to the web and the speaker system in the hearing room. If you make comments today, if things get heated and you make comments that are sort of short and abrupt, they probably won't go on the record unless you're talking into this short microphone that goes to Valorie's recorder. So it's important that if this stuff is going to go in the transcripts and on the public record, you need to speak into the mics. And in the past workshops it's worked very well, and I'm sure this one will too.

Also, and I'll give you a reminder of this, when we break for lunch, if everyone could turn off their tall mics. There's a green light. During our last workshop, we had some private conversations that went out, that were broadcast, which was unfortunate.

(Laughter.)

CHAIRPERSON ALCORN: So, with that, because we're running a bit late, I want to get into the first batch of presentations. The first three presentations are all residential topics, and Bruce Wilcox will be presenting with some support from some of his associates.

So, with that, Bruce, you're on.

MR. WILCOX: Good morning, everyone.

We're going to be presenting three topics this morning, and each one of these has a Powerpoint presentation that has been copied and is available outside on the table. So they look like this (indicating), and we'll be going through these slides, if you want to make sure you have copies of those.

The first topic is residential construction quality for attics: ceiling insulation, air barriers, draft stops, and kneewalls. Work on this topic was done primarily by me, Rick Chitwood with Chitwood Energy Management, and Marc Hoeschele of Davis Energy Group.

Let's start the next slide, please.

To summarize what we're proposing here for changes in the performance method calculations for attics is we're proposing, first of all, to add a heat loss path to represent the typical heat flows related to air barriers and draft stop effects. So that's the first thing: We're going to add a heat loss path in the performance calculation methods.

The second proposed modification is to change the effective U factor for kneewalls and skyline shafts, using the same approach that we proposed in our previous paper on construction qualify for exterior walls. The proposal here is to do the same approach because that will allow the compliance approaches to be simpler and we want to make sure this is simple and understandable.

And then the third thing we're going to add here is a budget-neutral credit for builders who want to use high-quality insulation and have it verified so that they can get a credit for that. Otherwise, there is no compliance impact from the changes that we're proposing here, adding the heat loss and so forth.

So I'd like to call on Rick Chitwood now to discuss the survey data that is the basis for making these changes.

MR. CHITWOOD: So what I have today is actually some more field observations to provide just a little background on the type of defects we're talking about. There are three typical barriers that we see to properly performing attic insulation. These days we're seeing more and more architectural complexity in attics, more drop ceilings, tall ceilings, vaults, attic kneewalls, etc. We're still seeing a fairly large lack of training budget for insulation installers, and even greater than ever are price pressures to keep the price of installation low.

Next slide, please.

For ceiling insulation to perform properly, we typically need a few things to happen. The primary thing is that the insulation needs to be in full contact with its air barrier.

MR. RAYMER: Rick, these aren't part of the written presentation, these are -- I'm not finding the stuff you're covering right now.

MR. CHITWOOD: These are actually in the big -- there is that larger document.

MR. RAYMER: Okay.

MR. CHITWOOD: But they're actually copied in black and white, so the better place to go for this information is on the California Energy Commission web site and access this, where the photos are in color and in good quality.

MR. RAYMER: Thanks.

MR. CHITWOOD: So for attic insulation

to perform properly we need to see the insulation in contact with the air barrier, we need to see a continuous air barrier, with, of course, no voids or gaps, and, of course, no compressions.

So this first photo is of some R30 batt insulation installed in a vaulted ceiling section, and there is a web truss stiffener. This member right here is on top of the bottom truss cord. And that holds the fiberglass insulation three and a half inches above the actual air barrier, which is the drywall.

So then any little crack between the batts allows attic air to convect and move down into these open air spaces. So we typically, with infrared analysis, see these areas performing very poorly.

Next slide.

This is a common situation where they're installed some batts above a drop ceiling, so the ceiling area in this closet is down here two feet lower than the rest of the attic area. So they've used fiberglass batts, which again will have some voids to allow convective currents between this big open air space in the closet ceiling and the attic.

Next slide.

The same thing happens here. Again, the fiberglass insulation isn't in contact with the drywall. This is an area that has been insulated with batts for an equipment platform in the attic, and they've installed the batts and pushed them clear to the top, which, again, leaves almost a three-and-a-half-inch gap under all the batts. So convective air flow between that area under the platform in the attic is possible.

Next slide.

This is something we're seeing more and more: an architectural feature that is a 12-inch-thick partition wall in between two rooms. Here is just a little area where they've left out the draft stops, so we get convective currents between the interior wall and the attic.

Next slide.

This is an infrared shot of one of those partition walls. The quality is a little poor, but there is no draft stop in this column, whereas this column is draft-stopped properly. So this was a winter shot, so we see cold air falling into this interior partition from this column (indicating), but this column looks fine (indicating). So that opens a lot of square footage of drywall to attic.

This is -- We've actually in the proposal provided two different deducts for performance: one for winter and one for summer. Warm air convection in a case like this is a much more predominant convective current than summer, hot air convecting down. So we have a much smaller deduct for summer -- heat loss/heat gain -- than we do for winter.

Next slide, please.

This is an attic kneewall. It looks like this batt is just completely missing. Here is the eight-foot level and a plant shelf and then another three-or-four-foot added kneewall above it. And the majority of the kneewall seems to be performing well, and then there's one missing batt.

Inspecting this kneewall from the attic showed that the batt was in place and looked fine. What created this defect was just an air space that was larger than typical and allowed attic air to fall behind the batt, between the batt and the drywall. There is a demonstration in the lobby of this phenomenon. I've mocked up a little wall and there is an infrared camera so you can look at different batt installation techniques and different R values in infrared in a small sample.

Next slide.

This is a case where there is a drop ceiling in a hall closet, and when the insulators were there to do the walls, they should have done the little vertical section here, but missed it. The attic insulators could have solved the problem by filling this completely up, but they didn't.

Another problem here is the insulation on the attic level tapers right down to zero. So right here at this edge we would like to see 15 inches or so of insulation to get R38, but it tapers right to zero. So there has been insulation all around the edge, no insulation or bare drywall here, and a potential for open interior wall cavities.

Next slide.

This is a skylight shaft that's been insulated with craft-phased R13 batts, and there are lots of performance problems here. The insulation isn't in contact with the air barrier, which will be the drywall. We see gaps and voids. They didn't bring the insulation clear out to the corners. The skylight comes to here (indicating), but they kind of stop right at that level, so the corners are uninsulated.

And we also have air intrusion. For fiberglass insulation to perform in a vertical installation at its rated R value, we need an air barrier on both sides of the insulation, not just one side. So here we get attic air intruding into the fiberglass from the attic side.

And that's the last slide. This is my favorite slide, just illustrating what we see too much of in the field, and that's just a complete noncaring attitude, and this insulation was installed but doesn't perform at all in this little cantilever floor area.

MR. RAYMER: What did they -- The one in the middle, did they just smash it to --

MR. CHITWOOD: They just threw them in.

MR. COTTRELL: Just a quick question, is this -- do building inspectors ever say, hey, straighten that out? I mean, is this prior to being closed in, or --

MR. CHITWOOD: This is all prior to being closed in, and all --

MR. COTTRELL: Prior to inspection?

MR. CHITWOOD: All prior to inspection, and all typically gets inspected. But we seldom see building inspectors with enough knowledge to reject insulation -- reject the insulation on performance issues. As long as it's there, it's typically passed. There are a couple of exceptions to that, but it's not typical.

MR. WILCOX: Okay. Let's shift back to the other slides, so next slide.

Okay. So in preparing the proposal here, we reviewed a randomly selected a group of ten houses out of the sample that was known for the Energy Commission's residential construction quality survey, and looked at those ten houses and what the ceiling defects were in each of those ten houses, calculated a summary on winter defect and a winter-only defect. And this table shows the summary for each of those houses.

The average summary and winter defect, which is the one that is in the attic and operates both in heating and cooling is .005 BTUs per square foot of ceiling, and the average winter-only defect, which is primarily the ones that are, the walls that are connected with holes to the ceiling so they can convect in the wintertime, is

.015 BTUs per square foot of ceiling area.

We'll go to the next slide.

So we're proposing to add, in the performance calculation, a .005 BTUs for the summer and .015 for the winter. These are, particularly in the wintertime, a substantial increase in the current UA for a nominal R30 ceiling. These will go into the standard design, and into the proposed building unless the builder proposes to do a certified -- a high-quality insulation and have it verified. And if you do that, then you don't get the additional heat flow and you get a performance credit through that method.

MR. RAYMER: And you're doing this -- Bob Raymer of CBIA -- you're doing this on both sides of the equation, but if you go to the quality control you get the credit.

MR. WILCOX: Exactly. Thank you for a good summary, Bob.

And then for kneewall and skylight shafts, the same thing on both sides of the equation, you assume that the insulation installed R value is degraded, using the same formula we used for the exterior walls. And if you do choose to do a compliance credit, you can do that and get the full credit.

So that's the proposal for attics, and we're now open for questions and comments.

MR. PENNINGTON: I have a question. The basis of the calculation that's being proposed here is based on problems in draft stopping, basically, right? It's problems in not establishing a proper air barrier above cavities, that sort of thing.

Am I understanding this correctly?

MR. WILCOX: Well, that's one of the problems. That may be the largest affecter, but there are also cases in this ten-house data set where there are uninsulated ceiling areas and uninsulated kneewall areas and so forth, so those are all accounted for, but the draft stops is certainly one of the biggest problems.

MR. PENNINGTON: So basically, the calculation is based on the notion that you're getting attic air falling into cavities, you know, what soffits, what walls, whatever, and that that's happening, that's having a significant effect in the winter and not such a significant effect in the summer.

MR. WILCOX: Right. The assumption here actually is, that we've made is that there is no -- if you have one of these vertically, vertical wall cavities that's not sealed off at the top, that that operates in the wintertime but not in the summer. So we're not taking any hit in the summertime for the draft stop problem.

MR. PENNINGTON: And this is basically, it's kind of hard to assess who is at fault here, in terms of getting, you know, having these defects, that this is generally not the insulation contractor's job, to seal this off. It's generally nobody's job, basically, and that's one of the issues here. And that this is becoming more and more prevalent, as the complexity of the architecture changes, and so that's what we're trying to address.

MR. CHITWOOD: Right. Often, the framing contractor isn't framing things so that they can be efficiently and easily insulated. Truss manufacturers are doing skylight shafts and adding beam walls with flat two-by-fours so there is no true cavity to be insulated. So it's -- there are a lot of things that cause this, it's not just insulators not doing their job.

MR. PENNINGTON: Okay. And this also has not only an energy consequence, but is presumably a fire safety problem; is that right?

MR. CHITWOOD: With the draft stopping, definitely.

MR. PENNINGTON: With the draft stopping missing. Okay.

CONTRACT MANAGER ALCORN: Charles?

MR. COTTRELL: Charles Cottrell with the North American Insulation Manufacturers.

CONTRACT MANAGER ALCORN: Charles, you need to get the tall, thin one too. You need both of them.

MR. COTTRELL: Oh, okay. All right, I'm sorry.

Just a quick question: Similar to the previous data set, we're talking about ten homes, again. One of my concerns about that is, especially in this case, where you look at the variation in those numbers, the UAs, varying from zero to basically it's 115.8, what sort of confidence level do you have that this is really representative of what's going on out there?

MR. WILCOX: Well, I think that the confidence is based on the fact that this survey was intended to be representative and I think if it wasn't representative, I would assert that it probably represents better performance than typical houses, because it was selected from builders who were participating in programs where they were sealing their ducts. So these weren't houses in which people actually did duct ceiling as part of utility programs, so it was not -- I think that you could assert that it's probably a better performance.

If you select a random sample from these houses you get a range, but the typical house is not defect-free. I mean, there are no houses that are defect-free.

MR. COTTRELL: Are those three that have just blank lines not --

MR. WILCOX: Well, they're --

MR. COTTRELL: On the winter-only side, I'm sorry, I'm looking at the winter-only --

MR. WILCOX: -- but they all have something in the summer-winter defect column, so there is some defect.

So I think that it's pretty reasonable -- you know, if there were three houses here that had defects and seven houses that had no defects, then you might be able to argue that we somehow managed to get houses that were unusual. But it's, I think the sample would lead one to believe that the defects are pretty common.

The precision about the absolute magnitude of the defects is, you know, we clearly don't have thousands of houses here, so maybe the absolute magnitudes are not very precise, but that's, I don't think that's the issue, in terms of the issue about whether you should have a credit or not.

MR. PENNINGTON: I have a question that relates to the question, if I could.

Bob, are you familiar with BII's survey work related to these kinds of envelope problems?

MR. RAYMER: Not to testify on it, Rob, who couldn't be here today, would be.

MR. PENNINGTON: And basically, the report that has been done, you know, not only the collaboration report that was done back in 1999 but also the reports that have been done annually, reporting on defects seen in the field, have reported these kinds of defects and observations, that they were seeing these kinds of defects.

MR. RAYMER: Yeah, that's the case. I

don't know the precise numbers, but yes.

MR. PENNINGTON: Yeah. At the last workshop when we were talking about this, Rob did say that they were finding similar levels of defects in the independent inspections that the building industry was doing.

MR. RAYMER: Mm-hmm.

MR. COTTRELL: I guess the other thing I'd like to do is just emphasize the point that you made, Bill, about the fire-stopping or draft-stopping issue, that these are clearly a building safety issue that should be addressed by the local building official, and I know when I was building that, I mean, they looked at that very carefully when they walked through a building, where you transitioned from a horizontal to a vertical space that there was some sort of blocking or something to keep the fire from rolling around that corner.

So the safety or fire safety issues far outweigh the energy considerations in this.

MR. RAYMER: It's a requirement.

MR. COTTRELL: Yeah, it's absolutely a requirement. It says that the local building official is not doing his job.

MR. CHITWOOD: And I think that goes

back to the increasing complexity of houses these days. We're seeing such intricate soffits and dropped areas and plant shelves and light wells that they're very difficult to fire-stop and draft-stop all the different paths from one level to another.

MR. COTTRELL: It may be difficult to do, but it's not difficult to identify where it needs to be done, and -- but the building official is not enforcing that part of the code, I think is a big concern.

MR. CHITWOOD: Actually, that's very true. And it just is a complex thing, and we're seeing a lot of them slip by.

MR. PROCTOR: John Proctor of Proctor Engineering Group. The work that was done at Princeton in the early 70s discovered these very defects, which have continued to this day, and they're quite well documented. They were first named back then as convective loops and thermal bypasses.

So I think we can be very confident that they're widespread, given over 20 years of observation.

CONTRACT MANAGER ALCORN: Bill

Mattinson?

MR. MATTINSON: I just have a question about the numbers. On the slide it says there's a .015 for the winter condition, and it looks to me -- Maybe I'm misreading them -- on page 73, that it's a .02 for winter in the document itself?

MR. WILCOX: There is a rounding is what I would assume.

MR. MATTINSON: That's a pretty big rounding.

CONTRACT MANAGER ALCORN: Which page of the document?

MR. PROCTOR: Page 73. I'm looking down where it says Proposed Design, and then the third paragraph, the first one says -- well, it says .02 for heating and .005 for cooling.

MR. WILCOX: Well, the summer and winter and the winter-only are added together for winter.

MR. PROCTOR: Oh, I see.

MR. WILCOX: So the total in winter is .02.

MR. PROCTOR: I see. Okay, thank you.

MR. NITTLER: Ken Nittler with Enercomp. A couple of implementation questions, looking again at page 73.

The first observation -- I just want to make sure I've got this right -- that the envelope construction quality credit were linking both the wall and the ceiling. You've got to do both to get the credit, okay, so that's one observation.

Another one has to do with the paragraph that talks about a .69 multiplier for walls or .69 or .94. The way this reads is a little bit different than the earlier paper. In essence, I guess my question is what gets reported on the compliance forms. We're going to go ahead and present the U factor, the form three isn't going to have any of the stuff in it. It's going to show the U values basically as people see them today, and this construction quality multiplier is hidden and buried only in the software, or do we modify the form threes to explicitly show the .69 factor?

MR. PENNINGTON: Well, this was perceived as a compliance option for the performance standards approach. So does that respond to your question?

MR. NITTLER: Not really. I think there's a significant issue here, whether the users of these compliance tools see what the impact is on the U factor of this assumption or whether it's completely hidden from them.

MR. ELEY: Well, if I may interrupt, Charles Eley, Eley Associates. I think, if it's a compliance option, it has to be documented on the compliance form somewhere. Now, whether it's -- I think what Bruce is suggesting, it's not an adjustment to the U factor, though, it's a separate term, but it would need to be documented. I'm not sure whether -- I don't know that we've thought about whether it goes on the form three or whether it goes somewhere else in the compliance documentation, but it has to be somewhere, though.

MR. WILCOX: Well, your point has to do with the walls and not the ceilings, I believe, right?

MR. ELEY: Right.

MR. NITTLER: I mean, it's easy on the ceilings to implement this, without showing anything anywhere else. It's very difficult, because the form three is the -- the .69 and .94 are applied to a portion of the U factor calculation, not the whole thing. And so what we present to people using the software and building officials and what not on U factors is greatly impacted by how you package it.

Sitting here as somebody who implements it, I don't know how I'm going to implement it right now as it's written.

CONTRACT MANAGER ALCORN: Bill Mattinson and Dave Ware.

MR. MATTINSON: A related issue that's going to come up real quick is when we get into the load calculations I'm -- you know, the software takes the U factor and multiplies it out to develop the cooling and heating loads, and I'm wondering whether you have tested or untested walls and ceilings, and, of course, tested or untested ducts, how that plays into the load calculation which becomes very much more critical under the proposed cooling-sizing restrictions.

So that's just a related issue that needs to be worked through.

MR. WILCOX: I think the important thing on the U factors is whether or not, since those are used prescriptively and they're shown in the manual for specific constructions, my assumption was that those wouldn't change, that the adjustment would be done inside the performance method. But perhaps there are too many issues there. I think it's open to discussion about whether this gets shown or not shown.

The intention is that all of the degraded factors would be used in the cooling calculations, the load calculations.

MR. ELEY: Since you did not test your walls or ceilings, you could have larger systems.

MR. WILCOX: Yeah.

CONTRACT MANAGER ALCORN: I think we missed a portion of that on the recording.

MR. ELEY: Well, I just noted that if you do not test your walls or your ceilings, then the procedure would enable you to have a larger air conditioner or heater, or air conditioner, at least.

CONTRACT MANAGER ALCORN: Dave Ware.

MR. WARE: Dave Ware with Owens Corning. I have a number of questions and comments, but first I'll speak to this one.

It was my understanding in the wall recommendations, and I could be wrong, but that the intent was to show the calculation. What Bruce just stated may be correct, and it's only an indication that none of this has been clearly thought out, but that they recalculated U values for various assemblies, stand pat, but in the form 3Rs that the program uses, I would strongly encourage that the degradation of the actual U value be shown and that it show up on the form.

Otherwise, you know, this is smoke and mirrors, and there is no way, then, to track what is going on, and as Ken says, to report things accurately or to modify things in future years, based upon more complete data, so some way that -- you don't want this transparent, it needs to be completely evident, not changing, per se, what's in the design manual for standard U value calculations, but when the ACM -- Again, I'm trying to summarize -- when the ACM calculates this and does a form 3R, which it seems like Rick has done in the appendix, there is a multiplier attached to the actual U value calculation, and that was one of my questions, is what is that .07 and the .93 number that's multiplied to there.

So, you know, there is some number that has shown up that devalues the actual U value calculation at the end.

MR. WILCOX: Okay. Well, so we tried

to be really clear on what the proposal was for the ceiling insulation, which was to do this as a separate heat flow path, it's an additive heat flow path, so it's -- you do a construction quality inspection and you get zero add or you don't do it and you get an add or a .2, or a .02 or whatever the number is there.

So I think it's clear that there is no impact on the form three for a ceiling insulation, right? I mean, that's what we're talking about today.

MR. WARE: I don't think you can divorce the two, okay? What we're talking about is indeed ceiling, but what we're talking about, the point that's been raised is the manner in which the U values is calculated on the form three, yes, for ceilings, but it also applies for walls and any other thing that we're doing.

So the same procedure -- Let's not, for instance, have one procedure for ceilings and another procedure for walls or floors. That's way wrong. The adder or the multiplier may be different, but let's use -- let's implement the same procedure, consistently.

MR. WILCOX: Okay. Well, there

actually is a physically different mechanism involved in the attics with these bypasses that are connected to the attic air from the interior walls. That's a different situation than you get with a wall system. So that's the basis for deciding to treat this as a separate heat flow path is because, number one, it's different in summer and winter, that's very difficult to do in the form three. There's no way to do a form three multiplier that has a summer-winter component to it that I know of.

So that's why we decided to add it in to the ACMs as a separate heat flow path with a summer-winter component. It's treated sort of the way a radiant barrier way, with a different summer and different winter impact. And that mechanism is already there for the radiant barrier cases.

MR. WARE: Okay, and that was one of my questions that I wanted to address. Bill hit on that, and that is that it seems to be implied from the writeup, it's not extremely evident but it seems to be implied that the greatest loss due to the quality of ceilings is the lack of air barrier or air intrusion through the system, not the quality of an insulation, per se. And that's what

I believe you just stated, Bruce.

And so the manner in which you are proposing to implement that is not completely evident in the writeup. If you look at the table that's on page 72, as Charles Cottrell brought up, there are several buildings that don't have any winter defect UA, but somehow you've calculated a summer and winter defect UA, and the writeup doesn't explain how you did that. You know, what were your assumptions? What subjectively did you use to get that, to arrive at that number?

It's easy to tally up numbers on the form, representing only ten buildings out of 200,000 homes on average built per year, and say that this represents the world as we see it in the state of California. And so Owens Corning opposes the procedure until we understand this better.

I don't see how you get the air intrusion aspect into the summer and winter UA when you have no winter defect UA at all in a number of these. That's one issue. Maybe I can continue on a little bit more with a couple of other concerns.

It's already been stated that there seems to be no acknowledgment that the enforcement community can do their job, and I think that that is incorrect. I think the enforcement community can do their job, and Rick already stated that my impression was a number of these houses that you took these pictures from were prior to insulation inspection. And I would certainly hope that the site inspection would take care of a lot of the defects that were shown.

I do agree that the types and design diversity going into buildings make it more difficult to do everyone's job, but that doesn't mean that it can't be done and cannot be identified.

There was a statement, both in a proposal in the report, and Rick alluded to that in what he stated, that fiberglass is typically used for ceiling insulation, particularly in kneewalls and vertical shaft areas, kneewalls and skylights, has a problem because there is air intrusion through the insulation from the outside. And the recommendation proposes a very specific type of backing on vertical framing members in the ceiling, which we oppose.

There is no evidence, thermal evidence that that kind of backing that's being proposed, a very specific kind, will do any better than a netting, for instance, which many installers use on kneewalls and/or vertical shafts, such as skylights, because of attachment needs. So I oppose that specific type of recommendation that's in the report.

There was another area in here I wanted to --

MR. PENNINGTON: If you're pausing there, I'm wondering if maybe I could respond to that particular thing.

Does the netting correct the problem that you're seeing?

MR. CHITWOOD: It can correct a great portion of the problem. The netting, assuming there is a cavity that is actually framed for a skylight shaft or an attic kneewall, the netting could hold the fiberglass insulation in contact with the air barrier, the drywall. We still would get some air intrusion in the back side, but there isn't good data to assess its magnitude.

It's something we see in infrared, but as far as a good back basis to degrade it a certain amount, the bigger issue is in contact with the air barrier on the front side.

MR. PENNINGTON: So in a situation where it's not framed, is that the problematic case that you're -- that's why you're recommending this particular approach?

MR. CHITWOOD: It's a very problematic case in that the typical installation method that we see is through stapling, where they'll just plate, like this skylight shaft that was in the slide, where a batt will be through-stapled into the framing that is there.

I can't remember an instance, other than work that we've done, where I've seen netting to hold insulation in place, either on an attic kneewall or a skylight shaft. It's not -- It's a detail that would work much better than existing techniques, which is just through stapling, but it's one I don't see now.

MR. PENNINGTON: What is the common framing technique? I guess it's different for kneewalls than it is for skylight shafts, right?

MR. CHITWOOD: Most often, skylight shafts have no cavities, so there is no alternative that's easy and quick but to through-staple the insulation.

MR. RAYMER: So they put in the two-by-four -- Bob Raymer with CBIA -- they put in the two-by-fours flat, circumferencing the -- ouch, yeah.

MR. CHITWOOD: Right.

MR. RAYMER: You have nothing to attach to.

MR. PENNINGTON: So do you agree with that, Dave, that there is a problem with netting, if you don't frame the skylight shaft?

MR. WILCOX: Well, I'm actually -- my question for Dave was whether you're proposing that the recommendation ought to be expanded to include netting? Is that your proposal?

MR. WARE: No, I guess what I'm saying is the recommendation ought to, if there needs to be a recommendation that it ought to state something to the effect that a backing material shall be applied to vertical framing members in the ceiling area and allow the installers in the industry to find an appropriate material that would use -- I mean, because there are all kinds of materials that are typical.

Wires, for instance, are often used as well. So the particular -- I mean, I'd much prefer it to be much more open-ended and allow the industry to meet a performance requirement than a specific product type.

MR. CHITWOOD: Right. I agree, there definitely are other methods. Stick pins in washers with FSK-faced material would be another great solution.

MR. PROCTOR: John Proctor of Proctor Engineering Group. My observation and I want to check and see if it's yours, is that the primary problem here is that there is no contact or there's partial contact between the batt and the drywall, which leaves the air space --

MR. CHITWOOD: That's correct.

MR. PROCTOR: -- and it's not a closed air space.

MR. CHITWOOD: Right.

MR. PROCTOR: And the result of that is that air moves and, therefore, it ignores the fact that there is insulation in it.

MR. CHITWOOD: Exactly.

MR. PROCTOR: So the back side -- I don't want to focus too much on the back side because it's the contact with the drywall it seems to me is the issue.

CONTRACT MANAGER ALCORN: Bill

Mattinson and then Michael Day.

MR. MATTINSON: From what I've heard, it sounds like a big chunk of the problem that's creating these adders is the complexity of construction, the drop ceilings, the plant shelves, the skyline wells, the kneewalls, all of that, and I'm just wondering if it's possible to consider, and the reason I'm asking this is because we do a lot of work with low-income, self-help housing, people who aren't building complex buildings. If you've got a straight trust with no kneewalls, no skyline wells, no drop ceilings, isn't there an alternative we could use here?

I mean, that's something that doesn't need a HERS rater to observe. You can see it on the drawings and you can see it in the field in seconds. I'm wondering if that number could be ratcheted down for a simple case where there are absolutely none of those potential defects.

MR. WILCOX: Well, one reaction I would have -- I'm sorry, Bruce --

CONTRACT MANAGER ALCORN: Go ahead.

MR. WILCOX: -- is that part of the solution is going to correct other kinds of problems too, like poor air sealing at the top of interior walls, insulation that's not always installed properly. So having an inspection that focuses on sort of what's happening at the ceiling plane, sort of regardless of what the building is, I'm a little concerned about the notion that you would say for these kinds of buildings you don't need to think about what's happening at the ceiling plane.

Because in general, you could have all kinds of problems at the ceiling plane, and having some focused attention on that would be useful.

MR. MATTINSON: Well, I'm not suggesting we do away with the adder, I'm just suggesting an intermediate number that accounts for a chunk of it who wouldn't be present. The interior walls on that kind of construction would have top place, they wouldn't have these 12-inch open vertical plenum-type arrangements. It's just a thought.

These are homes that are built as simply as possible to get people who otherwise couldn't afford to be homeowners into this situation, and in many cases, they're built so modestly they don't perhaps even need tight ducts, so there is no requirement to get a HERS rater out in the field. And bringing one out adds to the cost.

And I'm not denying that we're going to get better quality, but if a big chunk of the defect is due to a situation that doesn't occur, then why penalize them for it?

MR. WILCOX: There is no penalty here, Bill.

MR. MATTINSON: There will be at the next round of standards, we all know that.

MR. WILCOX: Yeah, but you can argue it then, okay? But currently, these people will comply without having to do anything: no rater is involved.

MR. MATTINSON: I'm just -- Okay, I guess I'm looking at --

MR. WILCOX: I mean, the other problem is the free rider problem, right? Those people can get a giant credit for just building a simple house with a flat ceiling and having someone come out and verify that it's there. I mean, that's --

MR. MATTINSON: Well, you're right, I misstated that in that there is no credit or penalty this time around, but I'm foreseeing it on the horizon, just like we did with ducts, I mean, it's obvious.

CONTRACT MANAGER ALCORN: Michael Day.

MR. DAY: Thank you, and I'll try and be quick here. Michael Day with Beutler Corporation.

It would seem that with the invected loops, the majority of the adder is going to be through heat transfer through the drywall itself. But a certain portion of it would also seem to be infiltration into the home, especially in the winter.

Is this actually the case, and is some of it infiltration and is some of it simply heat transfer? And then I have a followup to that.

MR. WILCOX: Well, there is certainly infiltration that happens both in the winter and also in the summer, if the house is depressurized due to duct leaks or whatever. But we already have a compliance measure for dealing with reducing infiltration. And if you simply put a draft stop at the top and don't change the leakage from anywhere, then you're not going to impact the infiltration.

So we decided to keep this separate from infiltration and it really is a separate issue.

MR. DAY: All right, because what I was wondering is if you're doing the reverse case, if you're doing infiltration control, you're bringing in a certified HERS rater, you're doing a blower door test, would that potentially reduce a portion of this adder and should that be recognized in the effective amount of the adder?

MR. WILCOX: The way we've done the adder here, I think it's a separate issue.

MR. DAY: Okay.

MR. WILCOX: So we're not taking -- That's why the summer impact here is so small, because we're assuming it's strictly convective, not infiltration.

MR. DAY: Thank you.

MR. TRIMBERGER: This is Tom Trimberger representing CALBO, the building officials who have been already labeled as the culprit for this one.

(Laughter.)

MR. TRIMBERGER: But getting past that, I want to talk about -- you know, understanding that you had a sampling of 60 houses that were not necessarily inspected but you had afterwards some infrared testing that showed some problems and recognizing that there are problems in here, testing methodology and the verification, installation quality certificate.

Just looking at the nature of inspections, this is entirely different and more difficult and more problematic than the HERS testing that we already have in place, which I've already argued doesn't work well. The HERS testing that we have in place is a go/no go. Does it meet the pressure test or does it not? Is the TX feed there or is it not? And it's tested beforehand and then tested by the rater.

This one here, looking on page 74 of the measure analysis, gives a checklist of 20 or 30 items, all of which are subjective. Is the insulation compressed? Are there gaps? Is it compressed but not buckled or uniform in depth? All of these are in some way subjective. There are 20 or 30 items.

And then beyond that, to see how to do it properly, the installation procedures that follow that -- I don't know if this is part of the checklist or not but there are four pages of descriptions on how to do things properly, four pages of bullet items. You know, how to get the perfect installation, insulation installation in a house. And these houses are very complicated. You know, insulation cut around wiring and plumbing without compression.

Well, that's not all right angles. This is all difficult things. We're looking at insulation cut to fit around junction boxes, getting extremely detailed and precise.

So I'm just saying if this is done properly, you know, you're going to have, you know, the judgment of the installer and the judgment of the rater or the installation quality certificate person and perhaps instead of one visit, it could -- you know, I would think typical would be two or three. This is by the rater.

And I'm also looking at since the complexity and the number and types of corrections, I'm assuming that we're not doing sampling or are we doing sampling? With sampling, you know, when you're installing a type duct system, there are measures that you can do. And you've got to seal 30 joints, you've got to seal around the coil at certain locations, there's a methodology. But you're looking at hundreds if not thousands of inspection pieces here. You know, for every wall there are how many joints? There are how many penetrations?

I don't know how that could be done, I really couldn't support. I'm surprised to hear you say that that's on a sampling basis, but this is just an entirely different type of rating by a HERS rater than a go and no go. I see that as a large problem.

MR. PENNINGTON: Question: Why do you see the need for two to three visits?

MR. TRIMBERGER: Because I've got 30 items, you know, all top plates covered. Well, you've got to do all top plates in the whole building, you know, in each room, on each floor. Small spaces filled. Is that like 50 items? Fifty small spaces per house?

I'm just saying this is very detailed.

MR. PENNINGTON: I'm not quite sure if I understand you. Are you saying that these things would not be all ready for inspection at the same time?

MR. TRIMBERGER: I'm saying that anybody could find fault --

MR. CHITWOOD: And then come back for

correction.

MR. TRIMBERGER: If I'm signing my name to something --

MR. PENNINGTON: So you're saying that it might take three passes to get the thing corrected, that's what I'm trying to understand.

MR. TRIMBERGER: Correct, correct. They write them up a correction list or something, you know, that -- that's what we do. We go through a complex, often subjective list on complex building with a lot of different features to look at. This is more of what we have here.

And we go through an iteration that we write corrections. It's three pages the first time and then it's two pages and then it's one page, and then we can sign the thing off, just to get everything accomplished. And to go to this kind of detail, I'm just saying that you're looking at the same kind of attention detail. It's a lot different than a go/no go gauge.

MR. PENNINGTON: Well, ultimately it is a go/no go decision. What you're saying is that --

MR. TRIMBERGER: There are a lot of things that get you to that go/no go, rather than just looking at a gauge on a duct blaster.

MR. PENNINGTON: Well, it seems to me that part of it is sort of getting everyone up to the same criteria, and if there is an expectation that these things will all get done properly, maybe the first pass you do with a builder, it does take more than one pass. But if that's recognized as that's the criteria, then it would seem like subsequent to that, everyone involved would get informed about what passes, and it wouldn't have to be for every building multiple passes.

MR. TRIMBERGER: That would make my job very easy if that were the case.

MR. PENNINGTON: Right.

MR. TRIMBERGER: But in actuality, we do go out. We'll go out on inspection. Yes, we go through the first house, the first model, in very extreme detail. And in slow motion, explaining everything, what that is.

That doesn't allow us typically to -- It helps, but it doesn't make subsequent houses pass automatically, by any means. It's common for two to three inspections.

MR. DAY: Bill, I might have a way of

fleshing this out using a data set that's --

CONTRACT MANAGER ALCORN: Michael, you have to approach the podium, please.

MR. DAY: Sort of a question on a question, Bill.

Tom, there are a lot of production builders around Sacramento that build the same house time after time that have the exact same details inside of them. Do you find that after Beazer is building the 50th version of plan 1234 that you go out there and you are able to pass it the first time every time, or even with something like that, that's again a subjective and similar process, even though they've built the same house time after time, do you still find that you have pages of writeups and have to come back and do it again?

MR. TRIMBERGER: We find that we have pages of writeups and have to come and do it again. For instance, the same Beazer, you know, just to make up -- Maybe I shouldn't use names -- the same builder building the same model is going to have four alterations to the house where they can have four different elevations. They can have changes to the floor plan, the wall plan, the framing. You know, you can go to a develop and see the same floor plan, but it would be rare to see that same house.

So, you know, the duct system can be identical or close to it. You know, the windows and everything would be the same, but when you get into the framing in that level of detail, they aren't the same.

CONTRACT MANAGER ALCORN: Tom, I think Bob Raymer had a question about your comments.

MR. RAYMER: Just in general, I don't want to discount, at least for the short term, the time component for the building official in this. There is going to be one. Because there is going to be the learning curve and there is going to be, on everybody's part.

One thing for sure that has to happen here, at least two things, sort of like what we've done for tight ducts, the protocols that probably don't even exist in the subcontractor contract right now for insulation installation where right now you may have something as simplistic as the amount or the type of insulation and the number of dwellings. They're going to be covered by said contract.

You've got to have -- This has to enter into these subcontracts, and that's something that we've been expecting and we're ready to do, but there also has to be an education component, as Rick has pointed out, for the subcontractors as well. That way you're not going to be the principal or the school superintendent, slapping everybody on the knuckles, trying to get them up to speed.

There needs to be this early on process where the builder developer understands this is coming, this is getting into the contracts. The subcontractor recognizes it's there and they're getting trained so that it's not just this chasing the till, everybody is getting up to speed at the same time. If not, you're going to be spending days out there on this item.

CONTRACT MANAGER ALCORN: Okay, thank you. If we can start to shut this line of discussion down, we're almost 15 minutes over.

Dave Ware, last comment?

MR. WARE: Dave Ware of Owens Corning. When I paused, this is exactly the other item I was looking to make comments on, so I want to thank Tom for bringing it up.

I have concerns with it the same as Tom, so I won't go into that, but it's not clear -- Let me just expand a little bit on that discussion. It's not clear from page 73 in the ACM changes, there's almost a footnote at the bottom that implies that the page 74 stuff, the draft CF6R insulation and possibly, it's not clear whether the insulation installation procedures that continue on go with that. And it's not clear what triggers that stuff.

In other words, if the builder or the compliance engineer is doing a high-performance quality building, is it then triggered through the ACM that this stuff gets printed out from Micropass, or does this stuff always get printed out from Micropass. You know, it's just up in the air.

And then I certainly have some concerns with a few of the things that are in the insulation installation procedure list. I know this was taken from the web site, from consult's work before, but I will reiterate something I put into you in writing in the past, and that is that there is no technical evidence that shows that face stapling has any more performance benefits --

moisture, fire resistance, or thermal -- than any other installation technique. And so I would ask that that criteria or that language be struck or show the data.

I've submitted data to you that says that that's not the case, so I would ask that that be removed.

MR. PENNINGTON: A reaction just to that particular point: I think the significant concern is that if there is side stapling, there is a potential for creating a situation where the insulation is not in contact with the drywall, and if there is face stapling there is more likely to be contact between the insulation and the drywall.

And it seems like one technique is pretty reliable at getting that and the other technique may or may not be reliable. And actually, I'd like to have Rick's input on that too.

MR. WARE: Well, I understand the intent, okay, and I support the words from the intent; however, a properly installed system which our industry supports will provide you that contact. Because --

MR. PENNINGTON: So in order to get it

to be properly installed, do you have to sort of say how deep on the framing that you can do the side stapling in order to avoid there being, you know, tension on the batt that creates a lack of contact?

MR. WARE: Standard flanges are approximately no greater than one inch, and that -- when side stapling is used, that allows the normal -- What am I trying to say -- the expansion of the batt to provide contact with the finished drywall, and there is no degradation, again, of thermal or moisture, and there is no opportunity for convective loops around that one-inch air space. I've submitted those and referenced those test reports for you.

Now, I understand what you're trying to achieve, but achieving it and technically defending it are two different things, and we've provided you information that technically defends the situation of side stapling.

Now, I'll give you another example. Our company is going to be providing a non-flanged faced product under the criteria that's currently proposed, we could not install that. And I would have to challenge you and the Commission why. And again, properly installed faced batt non-flanged friction-fit.

Now, we're not talking about the installer compressing it or anything like that. He has to install, that person has to install that batt correctly. But our trials throughout the country with various builders have shown that there is a 40-percent increase in cycle time for installation, again, properly installing. That means they don't have to staple, they don't have to mess with the flange or anything like that. So what's being currently proposed would not allow that type of batt.

And yet, it would meet all of the builder necessities for increasing installation time, etc., and should meet -- actually, in some instances may even provide an easier fit into vertical ceiling applications that are so funky to begin with that make it almost one of those little bays you have to cut, and you don't have to deal with the flange on the end of that, you can cut those -- that batt, that face batt precisely to fit into that space.

MR. COTTRELL: Just very briefly, Charles Cottrell of the North American Insulation

Manufacturers Association. Just to emphasize, all of our manufacturers do advocate side stapling of the products and have done testing, thermal testing to show that the results are negligible when side stapling is used. Yes, if you were to shove it all the way to the back and staple it at the back you could have some effect, but any reasonable installation shows that there is no degradation.

I just also wanted to add that I have a number of comments about the protocol that are too much detail to get into right here, but I would like to submit those in writing.

CONTRACT MANAGER ALCORN: Okay. Thank you, Charles. We need to go on ahead before we move to the next topic and take a two-minute break, and we'll start back up in two minutes. Thank you.

(Brief recess.)

CONTRACT MANAGER ALCORN: Excuse me, gentlemen, we're going to go ahead and start up now, please.

All right, Bruce.

MR. WILCOX: Okay. We're starting up on the residential sizing topic. Work on this topic was done by myself and Ken Nittler, primarily.

Let's go to the next slide.

Overview of this subject: This is a new subject, really, a new area of potential standards in residential, California residential standards. As background, first air conditioners operating on peak in California's hot Central Valley climate typically draw 1.7 kilowatts per ton of rated capacity, and this is actually, residential air conditioning is a significant peak demand issue in California, and we're all aware of that situation based on the last couple of years.

There is a lot of field data that indicates that oversizing a fairly typical situation in residential. And the third thing is that the most reliable way to capture the peak electrical demand savings from envelope measures, from duct measures, from all the other things we're doing to reduce -- or to increase energy efficiency is to ensure that the air conditioners that are installed are properly sized, that if you don't reduce the size of the air conditioning when you increase the efficiency of the building that you lose some of those potential peak demand benefits.

Next slide.

What we're proposing to do here is to expand the current sizing requirements which are in the standards to include calculation of a maximum allowable cooling capacity. The goal of this is to prevent gross oversizing, that the alternative calculation method software will be required to do the calculation so that the 80 percent or so of the people who are already complying using that method will get this as an added benefit.

The procedures will allow calculations based on either the whole building or on a system-by-system basis for systems with more than one or buildings with more than one system. This is particularly an issue in multifamily buildings where there are many systems in one building.

And we're going to propose to have a tradeoff capability so that if you want to put in larger systems you can -- you'll be allowed to do that by putting in systems with a lower demand than a minimum system.

Next slide.

This is proposed to be implemented in

two different places, in the standards in sections 150(h)(3), establishing the maximum allowable cooling capacity with a couple of exceptions, we'll talk about those in a minute. And in the ACM manual with three new appendices: appendix L, which is the details of the procedure for calculating the cooling capacity; appendix M, which is the procedure for calculating, once you know what the designed cooling capacity is, what is the maximum allowable capacity that you can put in; and appendix N, the procedure for calculating the alternative exception for higher efficiency systems.

Next slide.

The exceptions, you don't have to deal with this if you're not putting in a cooling system or if you're not putting in an electrically driven compression-based cooling system. So this doesn't cover evaporative systems, it doesn't cover gas-fired systems at this point, it's strictly going after the mainstream electric cooling system.

Next slide.

So what's in appendix L? What we're proposing to implement here is referenced primarily to the ASHRAE handbook, Fundamentals 2000, chapter 28, which defines residential cooling load calculations. And then we're specifying a number of specific details in that calculation that must be used for the California calculations. You have to use the region X design data or region ten design data, which is traditionally what's been used in California in the current standards for commercial building loads and so forth.

We're saying that you specifically have to do block loads for either the whole building or by cooling system. We've specified which tables you have to use for which cases, so it's not as open-ended and there's not as much judgment call involved as the chapter eight typically allows.

We're saying that you have to use the Title 24 specified U factors. This relates to the questions earlier, that you have to use the U factors that are specified in the ACM manual, the design manual as modified. The California solar heat gain coefficient values, infiltration as calculated by the California ACMs, that's actually a major issue in terms of both simplifying and making the calculations more deterministic.

You have to use the duct efficiencies that we're using for seasonal fluctuations in the ACMs currently, and you have to allow for radiant barriers using the California ACM approach that's currently implemented.

We do all these calculations to get a sensible cooling load, which is the big issue really in California anyway, and then we have a simple formula that adjusts to get you to the rated conditions for picking the system.

Next slide.

This shows what the details of that are. I'm not going to go into the details of the equation, but we convert from the design conditions in whatever the location is in California to the standard rating conditions using a standard approach here.

Next slide.

Appendix M: Once you have the designed cooling load, then the maximum capacity is, you start with the designed cooling capacity and then you can use the next largest size in general. And for the special case of buildings that have more than one cooling system and you calculate the compliance for the whole building, then it's the designed cooling capacity plus 6,000 times the number of cooling systems. So you basically get a half a ton extra for each system.

So if you have a ten-unit multifamily building, you can get the next largest system on each one of those units is the idea here. So you can always round up to the next biggest unit. Plus, because it's a half-ton increment, you're actually getting some slop in there.

For a single system -- The next slide -- For a single system, for systems less than four tons, 48,000 BTUs, you get to add a half a ton, round up to the next increment that's available, essentially. Above four tons, then it's whole-ton increments because you don't get a four-and-a-half-ton system, that's not available.

And then if you're, in the particular case where you're putting in larger than a five-ton system, which we don't expect to happen very often, but maybe if Bill Gates was to build a house in California or system, you'd be into commercial systems, then you're into going up by 30,000 BTUs at a pop because that's what's available in commercial-sized systems.

Next slide.

Multiple orientations, we're implementing the standard compliance approach here that the maximum allowable size for a particular building that's being built in multiple orientations is the highest of the size that's calculated for the four cardinal orientations. For buildings with more than one cooling system, the orientation can be different, the maximum size can be different. It affects each system differently in the way the building is oriented.

So the idea here is to be, to continue the traditional approach here, that the first orientation is the one that's used. And that will determine the size for all of those systems.

Next slide.

And then finally, if your calculation says you're allowed to have a three-and-a-half-ton system and you really want to put in a larger one than that, you want to put in four tons because you want to make sure you can always be comfortable or whatever, what we're proposing here is that alternate procedure that allows you to put in any system that would have the same total peak electric demand as the three-and-a-half-ton system at the minimum assumed deficiency with the minimum fan efficiency as well.

So there is a calculation here that the total electric load is .117 watts per BTU, and you do your calculation with your proposed system and show that you have less than that, and you can put in whatever system you want.

We also -- This allows you to use a higher fan efficiency or better duct system design to measure the duct watts, using the procedure we're going to talk about in our next topic on duct systems, and you can get credit for that as well.

If you'll look at the last slide, this shows the CEC directory, where the -- across the bottom we have the SEER and on the left-hand side we have the BTUs per watt of cooling capacity, and the assumption that's being used, that's built into that .117 is that we're operating on that horizontal heavy line there, which is the one we've been using for the assumption about the electric input to -- as the minimum.

And so, as you can see, there are many systems with higher cooling capacity per input watts available, so that someone could go to one of these systems that has a 14 or 15 BTUs capacity per watt and get a substantially larger cooling capacity for the same input wattage and if they wanted to have that kind of extra cooling capacity.

So that's the proposal, and we're now open for discussion.

CONTRACT MANAGER ALCORN: Okay. Dee Anne Ross?

MS. ROSS: Dee Anne Ross, DAREnergy Consulting. I just want to go on record as saying that I'm concerned about this language. Having worked at the Energy Commission when we had a limit on equipment in the past -- It wasn't even a limit on the cooling equipment, but it seemed that whether it was a poor installation or incorrect assumptions about the expectations of the system operation, it was always blamed on the language in the Energy Code.

So, basically, the sins of the mechanical contractor are visited on the energy consultant. So any complaint about the system operation is blamed on the energy consultant, and being an energy consultant that's why I'm concerned.

So I would just ask that if this goes

forward that there be some education of the mechanical people and the consumer about what to expect of a system that's properly sized, how to operate it.

CONTRACT MANAGER ALCORN: Thank you, Dee Anne. Ahmed?

MR. AHMED: I just had a couple of questions. Is this only for performance method or is it for prescriptive as well?

MR. WILCOX: The intention is that it covers prescriptive as well.

MR. AHMED: Okay. Well, what I was wondering is if someone were to build a home with much better conservation or improved conservation measures but wants to have a size much higher than what is allowable because of fast cooldown of the house or whatever, is it permissible?

MR. WILCOX: Well, the proposal here would limit the ability of people to put in large systems and have fast cooldown. That's the intent, really.

MR. AHMED: But there could be individuals who might want it even higher than what you're limiting here, larger capacity than what you're limiting.

MR. PENNINGTON: Well, they would have to use a tradeoff with a lower electrical power.

MR. WILCOX: Yeah, it's pretty easy, I think, to get an extra half-ton or maybe even a ton if you do that, but the intent of this proposal is to not allow people to put in systems that are too big.

CONTRACT MANAGER ALCORN: Thank you, Bruce. If I could remind everyone to please say their name before they make their comments, thank you.

Bill?

MR. MATTINSON: Bill Mattinson with CABEC. Just to restate Dee Anne's point, back when there was a furnace capacity limit in the standards, we were doing Title 24 calculations then as we are now. And we would show that in the calculations as we were supposed to, and then a number of people ended up being unhappy with the performance of their HVAC system, but I'm talking about homeowners who went to their builder or developer and said I can't keep cool, even though there was a limit on heating, and that could be overridden with some cooling exceptions, all of that.

Ultimately, not only was the blame placed on the energy consultant because the builder said, well, they said we can't put any more in. From my personal case, when lawsuits come around they name everybody, and we were named, even though we had nothing to do with specifying the system, designing it, installing it, or anything else, and to just appear in those things is very costly and troublesome, especially when you know you had no part of the blame.

So to emphasize that point that I think Bob agreed to, we've got to make sure that it doesn't turn out like that again.

And just one final point, from my experience, at the time that the Title 24 compliance documentation is prepared, the builder often does not have a contract in place with a subcontractor, and has not selected a model, and it's the subcontractor who usually is responsible, not only for the particular model but for the size of the units. And that's all unknown.

So it requires a much tighter loop in connection, all the way through the process, that we're going to have to see.

CONTRACT MANAGER ALCORN: Thanks, Bill.

Tom, did you -- Oh, I'm sorry, Bruce.

MR. WILCOX: Bryan, can I just make a comment in response to that?

CONTRACT MANAGER ALCORN: Yes.

MR. WILCOX: The intent here is that the loop doesn't have to be very tight. You know, you will calculate, you'll do your runs, you'll calculate a maximum allowable cooling size, and then the contractor selects the equipment, fits him with that, and he has no problem; if he needs an exception he can do that, that's all done later.

MR. MATTINSON: Well, the problem is if he does do that against his will, he says, well, I'd like to put in a five-ton, it says here I can only put in a three and a half, so he puts in the three and a half to be legal, and then the homebuyer is uncomfortable. He turns to them, and they point the finger somewhere else, which was the Commission and us and our colleagues.

It was uncomfortable and expensive.

CONTRACT MANAGER ALCORN: Charles on a followup?

MR. MATTINSON: Because we are the link that's bringing these regulations to the job site.

MR. RAYMER: Which is why it's important to blame the energy consultant.

(Laughter.)

MR. ELEY: Charles Eley, Eley Associates.

As I understand this, then, an approved ACM would be needed for all permit applications, prescriptive or otherwise; is that correct? So you'd have to -- Well, let me ask my followup question and then I'll give you back the microphone and be quiet.

It seems that this might be problematic, and perhaps we could have some -- for prescriptive, we could have some square-feet-per-tons limit or something like this that could be precalculated so you didn't have to use an ACM, you'd just say, okay, I got a 1200-square-foot house, so I'm allowed X tons in this climate.

MR. MATTINSON: Well, you know, we've always had, the load calculation requirement has always been there for every application -- I mean, there is no exception that says if you're doing prescriptive compliance you don't need to do heating and cooling load. So I don't really see that this is any different.

MR. WILCOX: Yeah, the current -- and part of the context here is the standards already require that the calculation be done, it's just there is no criteria for how big it can be.

It's certainly possible for -- We haven't talked about exactly how this would be implemented in terms of ACM tests. It's certainly possible to have a cooling load only calculation that implemented these rules and then could be used separate from the ACM process.

Part of the context for working on this topic, it's our understanding that most people who do explicit calculations actually use the current ACM as part of that calculation. And so implementing it in the ACM context seemed to be the way to serve the industry in the most efficient and easiest way.

So that's one of the reasons for doing it this way. I think the -- we talked a lot about the idea of trying to have a square-feet-per-ton limit. I think one of the objections to that is that that's the approach that we're trying to get away from here is not telling people that there's some simple way to size systems that isn't related to the real loads on the building and what the real systems that are in place deliver in terms of efficiency.

And so the consequence of that is you really do need to do a calculation, and that's what's proposed here.

CONTRACT MANAGER ALCORN: Okay. Tom Trimberger and then Noah.

MR. TRIMBERGER: Two comments -- Tom Trimberger from CALBO.

I do see this being a little different enforcement for prescriptive versus performance performance. You know, it will tell you what you're allowed load is, not a lot of argument, but, you know, I was around back when with the old regs limiting the sizing. It's a little bit of an art to size air conditioning and such, and there is interpretation and there is -- you know, people have their ways. And even within an ASHRAE specification, you know, they can put their loads the way that they want.

Secondly, this is really looking at gross oversizing, not trying to target those that are a little bit oversized. I didn't see anything in the measure analysis talking about, you know, what's the market doing now? Is the gross oversizing, is it a big problem or are we going to be writing regulations that are going to be easy -- that everything is going to pass anyway, so we're just making work for ourselves?

CONTRACT MANAGER ALCORN: Okay.

MR. RAYMER: Well, is there a response to what he's --

MR. PROCTOR: John Proctor, Proctor Engineering Group.

There are a number of studies in California and across the country that show very significant oversizing. So the question is will it affect folks? I think the good news is yes and the bad news is yes.

CONTRACT MANAGER ALCORN: Okay. Any comments on that, that train?

MR. McHUGH: Yeah, just in response to -- Oh, this is Jon McHugh. In response to Bruce's comment that using this method, this is sort of preventing sizing based on a rule of thumb of so many tons per square foot, but in a situation with a cardinal direction type calculation where you might be creating this limitation for buildings where all the glass is facing north, but you actually have a calculation that's based off of my west-facing, you know, in that particular house all the glass is facing west, is not particularly giving a particularly useful metric for those people that are building, you know, those quarter of the houses that are facing north, you know, or other orientations.

So is the idea that the requirement is based on a cardinal direction, but something related to some kind of information that's given to people about the inadvisability of sizing something so large when they have houses with the windows facing north?

MR. WILCOX: Well, I think that there is no reason that the ACMs can't print out the size for the particular orientation, but we're attempting to be realistic here about what we can expect to achieve. And, you know, I think it's definitely true that the standard in the industry is to size an air conditioning system for where you model and use that system on the model, regardless of its orientation.

And we haven't proposed to change that and say that you have to do sizing for each particular instance of each model. I mean, that would be maybe much better, and you would get a smaller system on the north-facing unit, but I think that's a major change in the way things are done in the compliance problems.

So we're simply going after the guy that oversizes for even the worst orientation by a ton, and we're going to drop -- in that case we would reduce the size for all four orientations by one ton. And that's an achievement, if we can get that to happen.

CONTRACT MANAGER ALCORN: More comments on this line of discussion here? Bill Mattinson and then --

MR. TRIMBERGER: Well, actually, you pointed to Noah earlier and skipped over him.

CONTRACT MANAGER ALCORN: Yeah, Noah, I don't know if you have a -- if your comment is on --

MR. HOROWITZ: Unrelated to that.

CONTRACT MANAGER ALCORN: Okay, could we hold that? We'll hold Noah's.

MR. MATTINSON: I have two things. One is the software already does print out the load for all four orientations, and the other one is from talking to builders they do not want to have to move from a three-ton to a four-ton, depending upon which spot the house is on. I mean, that's at least been past practice.

Another is that I don't think there is any restriction, if someone had a custom home that they couldn't run it a cardinal orientation if they thought it was going to get them a bigger air conditioner, and that might be the case for those people too. So yeah, there is a lot of education.

MR. WILCOX: Yeah, we're also intending to -- you know, we're going to use the, for example, the degraded U factors, which will increase the size and it will -- there are a lot of things in this that are not conservative, in terms of making, forcing small systems.

So it's certainly also, for those people who are used to using commercial load calculations and being very conservative, this is going to change the practice, because --

MR. MATTINSON: Well, one other question I neglected to mention. I notice you've said you can't use room-by-room load calculations, and my only concern about that is that as compliance gets tougher and builder get more concerned about doing a good job, we're going to encourage ACA manual D designs, which do mandate room-by-room load calculations, and is there a reason why you can't just accumulate those into a total, or --

MR. WILCOX: Well, the residential load method, which is what we're proposing to implement here, assumes that you can average the loads across the building, and that's a fundamental assumption, you know, that the air moves from room to room, things are not closed up, you don't have to meet specific loads in specific rooms, except in the case where there's a limited orientation on the whole unit.

And if you do have room-by-room calculation and treat the room as the block instead of the building as a block, you get much larger loads and that becomes a big loophole if you allow that to be done.

MR. MATTINSON: Because you're using the worst-case condition for each room, rather than the instantaneous worst-case for the whole house.

MR. WILCOX: Well, the residential sizing method assumes that you can do kind of a big average on all of the loads and mush them all together.

MR. MATTINSON: It just leads to doing two different calculations, you know, that make for more work for somebody. I guess that's good.

(Laughter.)

CONTRACT MANAGER ALCORN: Okay. Jim, did you have a comment, please?

MR. MULLEN: Yeah, if you're ready for a couple of general comments. I was going to do a general one.

CONTRACT MANAGER ALCORN: Okay. I thought Jim had a related comment, but, Noah, please.

MR. HOROWITZ: Okay. Noah Horowitz with NRDC. I'll be brief.

At first glance we're very supportive of this effort to reduce or eliminate the oversizing. It will give us great peak savings benefits. A lot of the comments I've heard, everybody is assuming that the number that's going to come out is too small, and from listening to the consultant it seems like they've taken a lot into consideration here and that we might be leaping to an incorrect conclusion here, especially given the roundup you've provided to size up to the extra half or whole ton.

So those are my thoughts.

CONTRACT MANAGER ALCORN: Okay. Thank you, Noah.

Jim?

MR. MULLEN: Thanks. Jim Mullen, Lennox, just a couple of general comments.

Obviously you're all sensitive to how sensitive this subject will be to the people that have to handle it in the end, so I would encourage you to study it carefully and be accurate in what you do, and probably make sure you get some input from installing contractors before you decide exactly how to handle this.

Along those lines, just working through the calculations, if I understand what you're trying to do on page nine, I can come to the same .117 factor you came from. I'd be happy to give Bruce my arithmetic and we can work out later if there is a difference or not.

Also, the sizing requirements, I think you'll find as you get into higher efficiency equipment that there may not -- there may be an absence of three-and-a-half-ton package units. You show the half-ton break point being four tons, which is probably pretty true in split systems, but not necessarily in packages.

The arithmetic seems to be based on a SEER 12 unit, and I wondered why that was as opposed to SEER 10, since when the standard goes into place I believe 10 will still be the minimum standard.

MR. PENNINGTON: We don't know exactly when the standard is going to go into effect. It's going to go into effect when the building code goes into effect in 2005.

The 2001 building standards that were just adopted by the state recently are going into effect in November of 2002. If you add three years to that, we may be looking at a November 2005 date if the process works just as well as it did this time to get to that effective date.

The federal standard is going to be going into effect in 2006.

MR. MULLEN: Yeah, January 2006.

MR. PENNINGTON: Right, so we're talking about a few months' difference.

MR. MULLEN: Okay.

MR. PENNINGTON: And so, you know, we've been trying to base our analysis on the assumption that as soon as the federal standards are in effect that those will be the basis of the standard.

MR. MULLEN: That makes sense. I thought at one time I'd heard that this was tentatively to be in place in January of 2005.

MR. PENNINGTON: That is the goal of the process.

MR. MULLEN: Yeah. If it is, this factor that's calculated on page nine in the .117 are out of phase with the world, for one.

MR. WILCOX: Yeah, this is definitely based on the SEER 12 assumption.

MR. PENNINGTON: We're talking about a few months' difference here, in terms of timing, maybe as few as three or four months.

MR. MULLEN: The other thing is the equation for sizing is a very good-looking equation. I think anybody could plug and chug these in.

The question I would have is, is the analysis available that was used to derive that? I guess it's a synthesis of equipment performance from something. It seems to be pretty critical to the size that you end up with and would like to study the ramifications of a little bit, but would like to find out how it came to pass.

So if somebody could point me in the direction of finding out who to talk to -- Maybe it's Bruce -- I would like to see the backup data.

MR. WILCOX: I'd be happy to talk about all the details.

MR. MULLEN: Thank you.

CONTRACT MANAGER ALCORN: Thank you, Jim.

Bob Raymer?

MR. RAYMER: Yeah. Bob Raymer with CBIA.

This is a very precarious area for us. We recognize the conservation potential that the Energy Commission is after here, and we're sensitive to that. And as several speakers have already pointed out, this is one of the leading areas that get individuals and builders, etc., etc. hauled into court. That's a very expensive process, and while I don't have a good handle right now on to what extent gross oversizing is occurring in California, certainly one of the things that -- one of the areas of analysis that we plan to pursue over the next coming months is taking what is presented here and applying it to some existing dwellings that perhaps have been taken to court because we just can't seem to get it cool or whatever, and see how this would have impacted some of the existing housing stock that's already out there.

And to what extent, you know, try to find out if there is a problem here, but I've got to say, having looked over some of the work that some of our other legal lobbyists have been involved with, this seems to be a very, very, very common area that has been presented in defect litigation and it just concerns me.

Right now under the Business and Professions Code there is no requirement that you be a licensed mechanical engineer to be doing this type of an analysis, and I'm not even sure that that would make such a difference. You need to be competent in the area that you're working in, obviously. But having said that, if the state were to sort of set a maximum and all of a sudden you have the house being used, albeit in an appropriate way but in a way that wasn't understood and assumed by the Energy Commission, it's going to be the builder and the subcontractor that are going to be on the hook.

We have a number of jurisdictions throughout the state -- I won't say just a number -- dozens of jurisdictions throughout the state right now that are experiencing a curious problem that has led to the promotion of occupancy ordinances. And that is where you've got one or two families or two and three families living in two-bedroom apartments, purchasing a home or renting a home together, where you've got huge loads, both heating and cooling.

Quite frankly, as an engineer, the homes weren't perhaps designed to meet this but they're being used that way anyway. And it's certainly something that has become a reality in Los Angeles and San Jose, a host of your Northern California jurisdictions around the Bay Area. It's become sort of a plague on the local governments because on the one hand, they're supposed to address the health and safety concerns of this, but there are also some very prevalent civil rights concerns that they also have to be careful with -- they're just standing back.

We have to recognize this is going to be happening. What can we do to make sure that we're not doing the gross oversizing, but that we don't necessarily enact something that's going to lead to another flood of litigation that right now we can't bear anything else. So we're going to be looking at that. Right now I just don't have a good handle on the amount of gross oversizing in California, but we're going to try and find out in the next couple of months.

CONTRACT MANAGER ALCORN: Okay. Bill Mattinson?

MR. MATTINSON: One final comment that I think may add something positive to this, although some of things some of us have said may have sounded negative.

Since 1993 my firm has been a consultant to PG&E on their comfort home program, which alone, among the current Energy Star home residential incentive programs, does have a sizing restriction. And it's something we've gone head to head with mechanical contractors working for the builders, occasionally, but that has gone way down, and we have far less instances of them proposing grossly oversized systems.

And PG&E's oversizing rules are slightly different than what is being proposed here, but they're along the same lines. They're similar enough that they're a pretty parallel case.

And in the few cases where we've really had people butting heads with us against that, we've worked with the contractor, we've brought in other PG&E folks, Marshall Hunt has gotten involved, we've given them training on proper load sizing calculations, and eventually they've been resolved to the satisfaction -- because PG&E's concern, obviously, was with peaks.

So I think there is a lot of evidence that it can work if there's good training and there's good enforcement. I'm actually quite optimistic.

CONTRACT MANAGER ALCORN: Okay. Thank you, Bill.

We need to start closing down topics, so Jon McHugh, Ahmed, short comments, please.

MR. McHUGH: Yes. This is in response to Bob Raymer's comment about overcrowding where additional people are placed in the building. And as I remember, I think it's around 400 BTUs per hour per person is the load associated with a person, and even just the half-ton slop that's allowed in this process, that would allow for the heat gain associated with 15 people.

So the issue of additional people and buildings, I think it's a little bit hard to state that that's going to drive this thing over the edge --

MR. RAYMER: I'm not saying it's going to drive it over the edge. It's a consideration that has to be made, and the assumptions with regards to the people, don't have those people coming in and out constantly, doing other things. And these are all variations.

I mean, if they're kids, they're going to be going in and out all the time throughout the day, as opposed to adults, who may be coming in and out at very select times.

MR. McHUGH: Right. So what you're suggesting is that there be that kind of consideration for infiltration associated with expansion.

MR. RAYMER: I'm saying this is a very difficult problem right now and there are some serious aftereffects that could occur here, and I don't have a good handle on if there's the gross oversizing that's occurring out there that can be tapered down, great, but at what point does that gross oversizing overlap into areas that right now are what the home users and the home buyers want.

So, I mean, this is -- we're in a new area here and, you know, it gives me chills to think -- going back to fixing this after the fact, we could have thousands of homes out there that all of a sudden --

MR. RAYMER: Right, yeah.

MR. PROCTOR: Can I mention --

CONTRACT MANAGER ALCORN: Sure, yes. That's okay, John, make your comment, please.

MR. PROCTOR: John Proctor. A few years ago, PG&E had a program where they changed out the air conditioners on approximately 200 houses, existing houses to manual J size, as close to manual J as they could get. And with the agreement from the homeowners, to the homeowners that if they didn't like it, they would put the bigger one back in.

And there were two cases where it was changed out. In one case, it was because the original sizing calculation was in error. And in the second case, it was because the people insisted on running the air conditioner with the windows on the second floor open.

(Laughter.)

CONTRACT MANAGER ALCORN: Ahmed?

MR. AHMED: I have a small comment here.

Bruce, as far as the capacity here, this is the capacity from the tables, not the nominal capacity, right? Because in air conditioning sizing, you've got to go to the tables for the CFM and the conditions of outdoor and indoor, you know, the wet bulb and the dry bulb, and then you select the unit. And --

MR. WILCOX: No, this is nominal rated capacity.

MR. AHMED: Is it nominal or is it what you get from the tables? I just want to be very clear on that.

MR. WILCOX: It's intended to be rated capacity, not -- I'm not sure -- We're not talking about -- John, do you want to answer this?

(Laughter.)

MR. PROCTOR: I don't know the answer, but I'm going to presume, I presume that the answer is that it's capacity -- it's translated into capacity at ARI standard conditions, but it's not translated into nominal capacity, meaning three-ton, four-ton, five-ton.

MR. AHMED: Okay, because the way it is sized, let's say, you take outside air conditioner, 95 degrees, 67 degrees wet bulb for a particular CFM, you select a unit. And it is not very clear, because sometimes you can get, let's say, three and a half tons, but you can -- even with the margin that Bruce is proposing, you could actually put in a four-ton system that would deliver three and a half tons.

MR. WILCOX: Right.

MR. AHMED: So you want to think through about this.

MR. WILCOX: Well, it's not nominal, because you do have that problem with that three-and-a-half-ton system that really is close to four tons or is close to three tons.

MR. AHMED: No, even on the nominal capacity table, if you look, if you look at the mapping on the four-ton capacity tables and the three and a half tons, for the same particular load, both units can suffice the need. So the question is how you're going to control that.

MR. WILCOX: Well, I think the ultimate, the intention here is to use the capacity that's specified in the Commission's directories, right? Isn't that what we're talking about?

MR. PENNINGTON: Right, that you can find in the directory, so that's what you're comparing to.

MR. AHMED: That will be the nominal, then.

MR. McHUGH: It would be rated, not nominal.

MR. AHMED: Yeah, rated but not performance-based. Because the tables have a whole map of performance for the same tons.

MR. McHUGH: Right, right. No, the number that is going to be used is a single number at ARI conditions, not different -- the number that's going to be used under ARI conditions is adjusted based on the design conditions for the particular place.

So different climates will -- But then it's translated back to an ARI test condition. And yes, it's better to size it the other way, to pick it the other way.

MR. WILCOX: Yeah, but we're doing is saying what the maximum is; we're not telling you how to size it. All we're saying is it can't be bigger than X. And you could do whatever you want, as long as it's not bigger than X, right?

So that's -- we're not saying you can't do a sophisticated sizing.

MR. McHUGH: It's limiting the total capacity of the unit at ARI conditions.

CONTRACT MANAGER ALCORN: Okay. Last comment, Marshall Hunt?

MR. HUNT: Marshall Hunt, PG&E. I just want to go on record that I do want to look at the details and make the connection between this and the manual D calculations. I think it can be done pretty simply, so -- I recognize Bill Mattinson's comments, so I'll be working with you.

CONTRACT MANAGER ALCORN: Thanks, Marshall.

Okay. I think we're going to go ahead, and we're running a bit behind, we need to start up on this next topic.

So Bruce?

MR. WILCOX: How much time do we have, Bryan?

CONTRACT MANAGER ALCORN: Well, I think we're going to have to push into our lunchtime a little bit. This topic has -- We're supposed to finish in 20 minutes.

MR. WILCOX: Okay. Residential ducts is the next topic. The work on this was done by myself, John Proctor and Ken Nittler.

For those of you who recall the topic paper for this, we had a number of things listed in there to look into. What we've come down to are these proposed changes for duct systems.

First is to increase the prescriptive duct insulation from R4 to R8 in climate zones 1 through 5 and 9 through 16. So this is an increase in the prescriptive level of duct insulation.

The second thing is an improved treatment for air conditioning air handler flow, or air flow, and air handler fan energy. The three major components of that are changing the way that the fan flow is measured using three methods, and we'll talk about those; adding an optional credit for measured fan lots so that if you put in a better-than-minimum-efficiency fan and duct system you can get a credit for that; and to change the focus so that TXVs have a credit on charge only instead of charge and air flow.

And the third sort of completely different topic is to prohibit porous inner core flex duct from being used, which is a subject that's near and dear to John Proctor's heart, and so we're going to make him happy here and hopefully not make anybody else too upset.

Next slide.

The duct insulation case is duct insulation is currently R4.2 for all ducts in all climate zones in California. What we're proposing is that we change that to R8 insulation in climate zones 1 through 5 and 9 through 16, that in climate zones 6, 7, and 8 that it remain at 4.2. This is based on a lowest life cycle cost analysis.

If you go to the next slide, to do this we estimated the cost of increasing the duct insulation and this is based on information from a variety of industry sources, including some estimates that were provided by Dave Ware, that this table shows the cost per linear foot of nine-inch flex duct, which is thought to represent the mix of duct sizes that are really put into typical production housing. The dollars per square foot of that is shown also for R4.2, R6, and R8 insulation.

And then using the standard rules in the ACM manual, we've estimated what the cost of that would be for a 1761-square-foot prototype house. So to go from R4.2 to R6 it would cost $65, and to go from R8 -- to go from R4.2 to R8 costs $108 extra. And so that's the basis of the life cycle cost comparison for the first cost.

The next slide shows the table which is the life cycle cost, life cycle energy cost savings, so this is what you save by increasing from R4.2 to R8.

There are a number of cases here. There is the case where you have the ducts in the crawlspace, and there's the case where you have ducts in the attic. The attic, using the calculation rules that we have for duct efficiency, offers slightly higher savings. Those are shown in the topic paper but I didn't show the table here. So the critical case is the crawlspace ducts, if we're going to treat them both the same, and that's what's shown in the table here.

If you look at the -- There are two sets of calculations: annual life cycle cost is the left three columns and TDV life cycle costs are the right three columns. Annual cost uses an annual electricity and gas cost. TDV uses the time-varying time-dependent valuation approach, and it provides, as you'll note if you look here, that the TDV energy cost savings are generally higher, and particularly in the heavily cooling-dominated climate zones like 14 and 15.

So the way that life cycle cost analysis works is if these life cycle energy cost savings are larger than the first cost, then it's cost-effective to do that upgrade. And you'll notice that in all the climates except the 6, 7, and 8 that we talked about earlier, the savings are larger than the estimated cost of $108. So, based on that, we're proposing to increase the requirements to R8.

R6 is also cost-effective, but if R8 is cost-effective, we jumped all the way to R8 in those same climate zones.

Next slide.

So that's the insulation part of this topic.

Now, talking about air flow, we're proposing to change the measurement techniques for verifying adequate air flow to allow three techniques: one is the flow capture hood, which is currently in the standards; the second is plenum pressure matching, which is also currently in the standards; and then we're going to add the new method which is called the flow grid, which is a new product. And I'm going to show you a couple of pictures here.

It's intended -- It's a new product that's designed to do these kinds of measurements, be fast and relatively accurate, and fits into most air handlers in a straightforward way.

And then to verify our new proposed credit for fan watts, we're proposing that you use a portable watt meter or the utility revenue meter to make measurements for that.

Do you want to switch to those other slides for just a second.

The three methods of measuring air flow: The duct blaster method is currently in the standards.

Next slide.

John Proctor was supposed to bring a flow plate to show you guys, so he forgot, so we're showing you pictures instead.

(Laughter.)

Next slide, please.

So this is the flow capture hood, and we're changing the name from flow hood to flow capture hood, because flow hood is actually the name of one proprietary product and otherwise not intended to be a change in what, in the requirements here.

Next slide.

And this is a flow grid, which is a calibrated pressure measuring device. There are a couple of different sizes, because you need different sizes for different-sized air inhalers.

Next slide.

And the way this works is you take out the filter out of the filter slot and put the flow grid in, and then you measure the pressure drop across the flow grid with the air handler running, and that reads out the CFM. And it's virtually instantaneous measurements, very quick and pretty accurate. And there's a set of spacers and so forth that you need to adapt to different sizes.

Okay, next, go back to the original slides.

So the table air flow measures, this

shows what we're proposing for measured air flow in the standards that -- and there are three cases. The base case, where you're not doing any measurements -- That's the line, the row in the table called None, and we're assuming that what you get then is 300 CFM per nominal ton. This is based on lots of measurements and field data that it's been referenced before. This is the value that was in the AB 970 calculations that we did in the last change in the standards.

The second row there is air flow for charge verification. The current charge verification procedure that's in the standards as an alternative to TXVs requires that you measure air flow, and the real reason for doing that is because you can't do the charge test unless you have enough air flow. So there is a level defined here that's sufficient to allow you to do the charge test, and that's the 400 CFM per nominal ton dry coil or 350 wet coil. And the -- I'm not going to talk in terms of fractional CFM per BTU here, but that's used in the equations.

And then the third level is what we call adequate air flow, and this is what gives you credits for having a good well-designed duct system that provides adequate air flow. This is called the -- This is what's referred to as the manual D design in the current standards, and we're proposing to replace that by a measurement that shows that you meet this standard in terms of CFM, that you have to measure it with one of these three methods, and that you're required to do a design, but doing the design is not sufficient. You also have to measure and show that you actually have the air flow delivered.

Next slide.

Now we're proposing, in addition to the air flow stuff, we're proposing to introduce the concept of air handler fan energy. Currently, air handler fan energy is not accounted for in the performance compliance approach for California standards, and it's -- in addition, it's defaulted generally and not realistically tested in the ratings for air conditioning systems. So we're proposing a new calculation here and a new credit. We're proposing to set the standard design to what we think is the average of real systems, which is .51 watts per CFM of air flow. This is based on lots of field measurements, and John can talk about those if there are questions.

And we're proposing to set the standard design air flow at this minimum nominal level of 300 CFM per ton, which is also based on lots of field measurements and it's not very good, but it's what the average appears to be.

And again, we're proposing a compliance-neutral approach, that those are the values that get set for the standard design and those are the values that get set for the proposed design if you don't propose to do anything about it, but that if you -- you can get an optional credit for verified reduced watts if you have adequate air flow.

Next slide.

Now, there is an issue here that has to do with TXVs, thermal expansion valves. In the previous version of the standard AB 970 rules, we implemented some credits for TXVs that assumed that TXVs partly compensated for low air flow. Since then PG&E has done some detailed tests and the results have become available and the tests show that there is actually TXV effect on low air flow.

If you go to the next slide, this is a plot of data from the PG&E test results which shows the percentage of nominal 400 CFM per ton across the bottom, so the 100 percent there is 400 CFM per ton wet coil, and as you drop the air flow down, the efficiency, the normalized gross EER goes down from its value at one down significantly. And within the experimental air, the TXV and the orphus (phonetic) cases are both the same; in fact, the TXV and the PG&E results is actually performing worse than the orphus at low air flows or at moderately low air flows.

So, as a consequence of this, we're proposing to five this TXV credit.

Go to the next slide.

And we're going to change the AC efficiency factors. These are the numbers that are in the current ACM manual that are used in the performance calculation methods --

UNIDENTIFIED SPEAKER: This is the proposed one, you're on the slide that's proposed.

MR. WILCOX: Yes, that's right, proposed. We're going to show first what we're proposing to use.

So this is the proposed set of factors which we would propose to be implemented and we're running pretty late here, so I'm not going to go into the details of this.

But if you go to the next slide, it's the current set of AC efficiency factors, and there is no credit in the current set for the air handlers in the same way, but if you go to the next slide, we have the real bottom line, the one that says comparison of -- Yeah, here it is. This is the comparison of the real bottom line of what kind of credits you get for what you're doing.

For the current measures under the current and proposed, you'll see that adequate air flow, now called manual D design, gets an eight-percent credit on compressor energy. We're proposing that that credit is still the same, you're going to have to measure the air flow instead of the current rules.

The refrigerant charge or TXV, if you just do that, under the current rules you get a ten-percent credit. We're proposing that that really is only seven percent, but that if you do both adequate air flow and adequate charge or TXV that you get a 14-percent credit, which is the same as the current credit.

So the only real change here is if you only do refrigerant charge or TXV, you're not going to get as big a credit, and that's based on these new test results.

Next slide.

Porous inner core flex duct: This is a flex duct that is -- the normal flex duct has a plastic liner and then it has a plastic jacket, and the insulation is between the two layers of plastic. The porous inner core flex duct does not have a solid plastic liner, so the only air barrier in the duct system is the outer jacket, and the consequence of this is when you're doing installation of the ducts or over time as the ducts are in place, if there is any damage at all to the outer surface of the duct, it's immediately a duct leak.

And so the evidence is that these ducts are worse, in terms of air leakage and that there is not a good way to deal with them. Florida already prohibits these kinds of ducts, and we think that it's kind of an oversight that this hasn't been done before in California, so we're proposing to use the Florida language to prohibit flexible ducts having porous inner cores.

That's it.

CONTRACT MANAGER ALCORN: Thank you,

Bruce.

Questions and comments, starting with Bob Raymer?

MR. RAYMER: Yeah. Michael Day had had some cost figures that he had come across and I'd like if you could possibly provide him with some input.

MR. DAY: Good afternoon. My name is Michael Day. I am the research and development guru over at Beutler. And on behalf of the Beutler organization, I would like to compliment the fine start made on this proposal, and also on the work completed by the contractors and by Mr. Ware in the insulation industry.

But we're not exactly sure that this package of measures makes sense as currently written, and with some pretty absolute certainty, we can tell you that the costs are not accurately modeled. As an example, the price that was given for nine-inch-round R4.2 flex duct is listed in this at 83 cents per linear foot to the home buyer. Our cost to the home builder is between 90 and 97 cents per linear foot, and a quick search of other catalog prices shows a range of between $1.59 and $2.64 per linear foot.

And I brought a couple of catalogs that are standard production, catalogs that have those prices contained within them. Our price is significantly lower, but that's only because we're one of the few HVAC contractors that have a flex duct manufacturing facility within their factory. Again, these are prices that go to the builder, and they're going to need to add on regular overhead and profit as well. So the material price, first off, we see as having some substantial differences.

But these are not the only costs associated with this. Labor associated with handling larger-diameter duct is an increased cost as well. It's simply tougher to maneuver larger marginally heavier duct in the attic, and primarily because with most houses being built now with prefab trusses, the spaces that you can maneuver this duct through because it has a larger diameter, you have to have -- there are fewer places where you can run the duct through, and there are limitations in that way.

This can come up to -- Our analysis shows that this is between 50 and 100 percent of the material increased cost. The transportation cost increased, because less material can be loaded onto a single truck going to the field. We can get, as a lot of you have seen in our manufacturing process and it's going to be the same if not more so for smaller HVAC contractors, we put a lot of this stuff together and we sent it out trying to get multiple homes on a tract in a single pass.

The fact is with larger-diameter duct, we can get fewer homes onto a truck. That means more packaging, that means more trips by the truck, and it also will end up meaning that it's an increase in vehicle emissions, as well as all of the other costs associated with transportation, time of the drivers, wear and tear on the trucks, gasoline or diesel fuel. Again, these costs are approaching the cost of the material increase itself.

Another large area of concern is duct board. Duct board is typically used for plenums and/or fittings, and while it's only a small percentage of the surface area, it is actually a fairly large percentage of cost, again going back to labor concerns, exclusively the labor concerns that we illustrated with the flex duct itself.

There is a tremendous benefit to using duct board over sheet metal, in terms of the number of injuries that are sustained by people who are handling it, and there are some real cost benefits to using duct board.

To go to R6 duct board, the price goes up by a factor of slightly greater than 2 1/2 times. And our 8 duct board, we asked our manufacturers and our suppliers, and nobody had anything that was R8 category for the duct board itself. Again, the cost of this small portion of the system, in our analysis, could exceed the entire material cost that was mentioned in the initial presentation.

But for the builder, there are other costs as well. Again, getting back to the trusses, prefabricated trusses, the size of the openings that our ducts would need to run through, especially as we're getting towards the edges of the houses, would need to change. That would change the sizing of the truss framing members.

Additionally, chases, because of tremendous number of houses now are being built two-story, the chases would need to grow. This again starts introducing framing changes and also reduces the square footage of the house that's being sold, again, not by much but it starts to add up.

Also, as ducts are being run through interstitial spaces, the TGIs might have to change or else we're going to start compressing the insulation or compressing the duct itself, and that goes against the entire concept that's here.

However, not all is lost. Again, we were pretty happy about the overall thrust towards increased duct quality. We think it needs to be done, and to be honest, we think that it gives us an advantage. There are some things out there that we think should be looked at in addition to simply heaping on more insulation.

One would be the examination of conditioned attics, a second that we brought up with the Commission some time ago was buried duct work or partially buried duct work in attics. We commissioned a study of this, and while the results aren't quite yet ready for prime time, the initial is showing that we end up with an average effective R value of approximately R15 for the entire system, within 80 percent submerged duct system.

Additionally, there might be a way to work this out to where it becomes very cost-effective to have a change in the standard that's needed for the flex duct itself, while having a separate value that's around for plenums and/or fittings.

Again, we look forward to participating in the process of refining this measure, and just in case nobody caught this before, we're on track to do about 25,000 units this year, residential and new construction in California. We have a lot of information about what's cost-effective. We have a fairly decent and active research and development staff at Beutler. We'd be happy to participate with the staff, and we look forward to helping in any way we can to make this measure better reflect fiscal reality. Thank you.

MR. PENNINGTON: Thank you, Michael.

I'm wondering if we can get a reaction from the contractors related to the difficulty of installing R8 ducts in current trusses? You know, that was looked at in the Davis Energy Group/Chitwood project.

MR. WILCOX: Yeah, Rick, do you want to come and --

MR. CHITWOOD: Rick Chitwood. In the 60 homes that we looked at as part of -- Actually, we only looked at room for R8 duct in the second phase of that, so we specifically looked at each duct run and whether or not there was room for R8 duct in that particular home.

And because most houses are leaning toward steeper roof pitches, in any attic we didn't see any problem for room for R8 and conflicts with the trusses. Where the conflicts started to happen were in two-story houses. Then presumably, if R8 is a problem, those spaces are partially inside the thermal envelope and maybe only R4 is required. So that would be an option, if there isn't room for R8 in interstitial spaces, R4 may be just as adequate, because it's partially or completely inside the thermal envelope.

But we didn't see any inadequate room in attics in the 30 houses we looked at.

CONTRACT MANAGER ALCORN: Thank you.

Dave Ware?

MR. WARE: Dave Ware, Owens Corning. I have a few comments and some recommendations as well.

First of all, I support the analysis,

but I think that the comments made by Beutler are good and we need to consider what those are. Nevertheless, I have a comment that if indeed R8 ducts or even R6 are cost-effective, then why not make that the mandatory measure? Why stop at the prescriptive requirement and allow a tradeoff to be done for the energy savings that would accrue from moving up to an increase in duct R value? That just doesn't seem right.

And, to that point, I'll make an example. We continue, the Commission continues to show statewide savings, based upon the package D requirement, when actually, that is a phantom calculation. Most builders will build to what a combination of mandatory measures and other features and may not actually achieve those savings.

And so, as a consequence, you may not even find that builders, because of some of the comments that were even made just now, would opt to go to the R8 ducts when you can -- when they can find a another feature. If it's cost-effective, then why not make it the mandatory measure?

The second point is I realize that the

cost-effective analysis threads a thin line between comparing the results of an LCC with the first cost of the measure, and so -- and if you look at the tables, they're, particularly in climate zone A, it's very close to the $108 that was estimated as the cost for the measure in the standard design building.

So my recommendation is why not, since they're so close, to make it easier on both the ACM compliance tools that we have, as well as less confusion in the marketplace, why not make it the prescriptive requirement for all climate zones? Why simply exclude those three when you're so close there anyway? Those are my comments.

MR. PENNINGTON: Mr. Day's comment was that the costs were underestimated by 2 1/2 times or something like that, and you're saying that you support that comment.

MR. WARE: Mm-hmm.

MR. PENNINGTON: So I'm not quite sure I understand you.

MR. WARE: Well, yeah, Mr. Day -- he threw in a lot of externalities to the cost. He questioned a number of different things. One was the raw cost of the material, and, you know, there were costs that I provided, there were costs that other people provided to you, and he's showing some other cost. So I don't know what is driving the differences of those. I think it's reasonable to look into that.

Now, he also pointed out some other externalities than just simply the raw cost, and, you know, I can't comment to that. Rick mentioned the fact that yeah, there may be some extra added care that's needed for a different product, and yes, there may be some extra added design considerations for a needed product, but that does not, in my opinion, necessarily negate the benefit of what's being proposed.

CONTRACT MANAGER ALCORN: Michael, did you want to respond to that?

MR. DAY: Yes. Actually, what we saw was that -- our analysis showed that for flex ducts that we're manufacturing ourselves, the material cost was understated between 40 and 100 percent, that for that which would -- I worked for another air conditioning company before I came to Beutler, and most air conditioning companies have to go to John Stone, Granger, other places where they'll buy something like the ATCCO product, and

I brought some catalogs.

There we're seeing an understatement of the material costs on the order of between 200 and 400 percent, just on the material costs alone.

CONTRACT MANAGER ALCORN: Thank you.

Bob Raymer?

MR. RAYMER: One other question. This was news to me. Could you maybe just briefly cover back again the problem with the TXV? What is it that you've recently found?

MR. WILCOX: Well, I don't know if we -- We can talk about it offline, maybe, Bob, but PG&E did a series of very careful tests in their test facility. The results of those came out earlier this year, and what they showed was that if -- what we had assumed from previous test results or what looked like was the case in previous test results was that if you had a TXV and you had low air flow, that the efficiency degradation wasn't as big.

Now, it turns out that with PG&E's careful apples-to-apples test, that didn't turn out to be the case.

MR. RAYMER: Okay.

MR. WILCOX: So that's what we're

changing. So you still get the same credit for a TXV against charge, and the overall credit for having appropriate air flow and correct charge is still the same, we're just not giving as much credit for the case where you have only a TXV.

MR. RAYMER: Okay.

MR. PROCTOR: Can I comment real quick?

CONTRACT MANAGER ALCORN: Sure.

MR. PROCTOR: John Proctor. The test that we relied on to come up with that before were between makes and models of machines, and PG&E set up in their test chamber the same machine with a way of switching between the two metering devices, so that you didn't even mess with the refrigerant, you didn't change anything except the metering device. And that's the results that you saw.

It's the first published apples-to-apples comparison that -- Well, it's the first published one that we know of. We know of some that weren't published, unfortunately.

CONTRACT MANAGER ALCORN: Okay.

Jon McHugh?

MR. McHUGH: Related to the requirements to flex duct, we were at a meeting recently where the discussion came up that one of the larger manufacturers of flex duct has an outer plastic cover that is not UV-resistant, and that they found that these were failing in attics, the insulation -- the outer duct was splitting, the insulation was falling off; the inner core was still intact, but that the R value, of course, was dramatically reduced. And this is just from light coming in through air vents.

And so along with the requirement related to not having the inner core be not porous anymore, we also have requirements for the exterior plastic on those ducts, that they be UV-resistant.

CONTRACT MANAGER ALCORN: Do you know what manufacturer that was?

MR. McHUGH: That was the ATCCO was the manufacturer mentioned.

MR. WARE: If I can make a comment on that, personally too, my ceiling is -- my ducts in my ceiling are falling apart because of that very reason, but the Air Diffusion Council has supposedly corrected that in their standard practice guidelines, and I don't know whether that's required by them or not. I'm not sure, and I could check on that, how that works, but they do not recommend and allow non-UV-protected exterior coatings to be used.

And, in fact, the majority of the industry no longer uses those, but certainly ourselves, and I know our FDM flex duct like John, ATCCO would support what Jon is proposing here.

MR. PENNINGTON: I agree with what Dave said, that this apparently was a problem that has been addressed by the industry. In fact, we talked to ATCCO about this problem or the potential for this problem, and they said that they've corrected this problem in their product line.

So I'm not sure how recent your information is, but, you know, during the AB 970 process we inquired about this with duct manufacturers.

MR. McHUGH: This is a meeting from two weeks ago, so --

MR. PENNINGTON: Well, this was -- I mean, we would need to talk offline, but I suspect what you're talking about is some, a project that was done by Chico State looking at existing homes so that the duct systems that were being evaluated were relatively old ones. I think that's true.

MR. McHUGH: Right. Now, my understanding is that he contacted the manufacturer and found out that there still is a problem.

CONTRACT MANAGER ALCORN: Okay. Are there any further comments on this topic?

If not, I think we should go on ahead and break for lunch. If we could try to be back by 1:25, that would be great.

(Thereupon, the luncheon recess was held off the record.)

--oOo--

A F T E R N O O N   S E S S I O N

CONTRACT MANAGER ALCORN: Okay. We're going to go on ahead and start up now.

I want to make everyone aware that we have an individual that's called into the workshop and may be piping in with comments. His name is Jeff Johnson from the New Buildings Institute. So he can hear what we're saying and he should be able to chime in whenever he has a comment.

Are you still with us, Jeff?

MR. JOHNSON: Yes, I am, thanks.

CONTRACT MANAGER ALCORN: Terrific,

thank you.

Okay. For the afternoon session here, our first topic is high performance relocatable classrooms, and the presenter for this topic is Leo Rainer from Davis Energy Group.

Leo?

MR. RAINER: This is a presentation on what we call relocatable classrooms, also known as modular classrooms, also known as portable classrooms; is that --

(Moves closer to microphone.)

MR. RAINER: Okay, I'm going to start again.

The presentation on relocatable classrooms, just to clarify quite a few names of these. We've referred to them as relocatable classrooms or RCs throughout the report, but people call them modular classrooms, portable classrooms, a number of titles throughout the industry and in school districts, but I'm going to call them relocatable classrooms throughout this.

What we're referring to is, next slide, pretty much typical classroom in California is either a 24-by-40 or a 30-by-32-square-foot classroom that's moved in two or three modules down the road and put together on site. You've probably seen these in most schools. They were used a great deal for the class size reduction, and they were also mandated at one time to be a certain, to be 20 percent of new classroom.

They consist of the two modules with a wall-hung AC unit with a -- you can see a through-the-wall return, typically two or three supply registers. There's a glazing unit at either end, usually either clear or a grey light, and a single door. And ten or twelve lay-in two-by-four fluorescent drawfers (phonetic). Things vary, they vary by manufacturer, but that's pretty typical of most of the current construction in California.

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A lot of reasons why portables are used: They're very quick to place. You can be just months between order and placing as opposed to years for site-built. They're relatively inexpensive, compared to site-built. They're flexible, which is really the reason they're relocatable. In other words, if demographics change, you can move them and reuse them at different sites.

And one thing I want to emphasize, they are popular. Teachers and districts really do like portables. If you're in an older school and you get a new portable with a system that works and has light and has a conditioning system that works, everybody I've talked to who works in these is usually very happy about them.

There are a number of perceived problems, though --

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-- a number of problems that have been seen either in the press or just in general, beginning with ventilation. Ventilation in these is problematic, mostly because the systems are not typically run 100 percent of the time. Or even if they are, there may not be sufficient outside air. They may not have been set up correctly in the first place, or they may not have even the ability to provide sufficient outside air.

There is some concern about volatile organic compounds. Testing that's been done, monitoring by LBL recently has shown that the materials in modular classrooms are actually quite good. Most of the VOCs that they found were from materials that were brought into the classroom such as dry erase or particle board from furnishings, but that the actual materials that they're manufactured from are reasonably quite good and the levels are not really a concern, if ventilation is provided.

Moisture and mold is an issue. That's been getting a lot of press recently, and most of the problems I've seen in the field are due to site problems, either lack of drainage or incorrect siting. Inherently in the portable it was not a problem with moisture except it's exacerbated by a lack of ventilation.

A light or a lack -- Yes, Noah?

MR. HOROWITZ: I have a quick clarifying question. Do the windows open or are they fixed?

MR. RAINER: The windows are openable. They're typically -- The windows are typically 8040 with two sliders, and, therefore, they do meet ASHRAE 62 because the windows are within 20 feet, though I think that the area is actually a little low, so I think you have to have more than five percent of floor area to meet 62 too.

So theoretically it does work, but from monitoring we've seen, even with windows and doors open, you can still have pretty high CO_2 levels, especially if it's a calm day.

Light or lack thereof is of specific concern because of just those two windows. These are -- The classrooms are usually stacked together, so you have just windows on the end, and they may even be facing an existing building. So you don't have a lot of light coming in through these windows, and to reduce it further they're usually grey light, grey light 14 or something, with very little light coming in, natural light.

So there is a lot of interest in providing natural light through skylights or other means, and some projects have looked at that.

And noise is an issue, specifically because it relates to ventilation. The noise from the wall-hung unit is significant because it has a through-the-wall return. You have the compressor and the fan very close to the classroom, and teachers usually either turn the units off or -- They won't leave the fan on typically because of the noise from the fan. They'll let it cycle or they'll even turn it off and open the doors because of the noise from the units.

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There are also some -- Those are more environmental problems or perceived problems. This is one of the energy and insulation insufficiencies in the typical classroom construction. There are two types of classroom construction: one is a steel rigid frame and the other is a wood shear wall, and the majority are steel rigid frame. And in the steel rigid frame there is a steel rough beam, a 20-inch rough beam or so that goes all around the perimeter of the building. And that is typically not insulated.

And that is actually in the conditioned space. Even though there is a lay-in ceiling below that, the ceiling insulation is up under the roof pans, so the plenum space where the ducts -- and above the lights is really conditioned space, and that rough beam really should be insulated, and it rarely is.

There is also a thermal short in the roof, because there are typically metal purlins at 48 and on centers that are used for supporting the roof. And they're a significant short in the roof, and so R19 which is used, you're not getting an R19 roof.

Next slide, please.

So just to summarize what typical construction is in the field, they even now are not really built to current Title 24 standards. I'll talk a little bit about the enforcement and what -- how the upgrade to plans needs to occur, but what we'll typically see in construction right now is R11 wall, R11 floor, R19 roof, you will see R30 roof in buildings that are built for snow load, those are typically -- they're specifically labeled for snow load conditions.

Lighting is typically 10 or 12, four lamp T12, F34, unless maybe the district may request T8s because they're already using T8s in their other buildings or some manufacturers have moved over to T8. But lighting densities we've seen are around 1.5 to 1.7 watts per square foot.

Heat pumps are a standard wall mount unit, a 10 SEER. Seeing about, right now about 20 percent have gone to the high SEER and 12 SEER units. And windows are typically double-clear or double-grey glass.

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So, in looking at this, we came up with three proposed changes that we think would address the problems we've seen. One is a single statewide prescriptive package of envelope measures that would bring these classrooms up to current standards. The reason to go to a single non-climate-zone-dependent is to simply enforcement. These are usually -- When the manufacturer builds these, they may not even know which climate zone they're going into or they may be moved; therefore, a single prescriptive package would meet all climate zones and, as we'll see in the results, there is not a significant difference as far as what levels would be cost-effective in different climate zones. And I think it makes a lot of sense to go to a single package and simplify things.

There also is a -- Currently in the overall envelope method there is a ten-percent glazing tradeoff. If you are below ten percent of wall area, you can use lower -- you can get a larger allowed glazing area. In other words, go to significantly lower-performing glass, and we are proposing that that loophole be eliminated, specifically for modular classrooms.

And then one thing I wanted to concentrate on is overcoming some of the enforcement barriers that have enabled the, or have not allowed the relocatable classrooms to be built to current Title 24. So although those each -- We'll first take a look at the package of prescriptive measures.

The next slide.

The prescriptive package that we came up with is increasing the wall insulation to R13 and insulating the roof beam, increasing the floor from R11 to R19. The lighting is 1.2 watts per square foot, which will be -- it's currently, I think, in another template right now. Windows would be a selective surface. This is a selective surface, low E, valuative .49 and .46 solar heat gain coefficient, but we're not looking at changing anything on the frames.

And the roof would be an initial solar reflectance of 70 percent, which would meet the cool-roof prescriptive package.

Next slide, please.

We looked at some of the -- I don't know how visible this is -- more of the colors is what -- all of the white are cost-effective net present value in the climate zones for each of these measures, individually. Individually, some of the measures do not make sense in some of climate zones, and this -- what we wanted to see was whether an overall package made sense.

Specifically, an R19 floor doesn't quite, isn't quite cost-effective in climate zone 6, because it's a very mild climate zone, and the cool roof is not cost-effective in 12 and 16, because there's significantly more heating than cooling in those climate zones. But overall, the package of measures is significantly cost-effective.

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The advantages, again, of going to a single prescriptive package is it's climate zone independent, the manufacturer does not have to determine which climate zone the modular is going into and the enforcement agency does not have to determine that. And, therefore, it simplifies enforcement. And we still have the option of a performance, to do a performance option if the manufacturer wants to change -- if they have something significantly expensive, they can still use a measure such as skylights or lighting controls to give them some flexibility.

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A little bit about the glazing

tradeoff. Typically RCs have about a six-percent wall area in glazing, and so it's below the ten percent. This ten percent value is, I believe, and I don't know if we established, it's intended for typically unglazed buildings that may have a small amount of glazing, let's say indoors, and so that you wouldn't have to find a door with high-performance glazing.

The problem in the relocatables, it creates an incentive to keep the glazing low, glazing area low, and we want to try to not do that, if people want to add windows for natural light. So we're proposing to eliminate specifically the ten-percent glazing tradeoff, just for relocatable classrooms.

Next slide, please.

I want to talk a little bit about the approval process for relocatables and how it impacts on Title 24 enforcement. Currently when a manufacturer wants to build a relocatable, they apply to the division of state architect for what's called a plan check or a PC number for their plan. This plan is a generic plan and it's looked over in detail, specifically enforcement of life safety -- fire, life safety, and I can't remember what the other one that they do is --

UNIDENTIFIED FEMALE SPEAKER: Structural?

MR. RAINER: It's structural, thank you, and accessibility.

The Division of State Architect has clarified that they are the enforcement agency for Title 24 but they don't currently have the ability to inspect for that, and they are currently working on enabling themselves to provide that service.

Once a plan has a PC number, that can then be used to build modulars, and each time a new modular is constructed they have to apply for an approval number from the DSA for that specific building. And at that time they look at where it's going to be sited, they look at siting issues, and they look at any other specific things to just that building.

And then when it's built in a factory, it's inspected in the factory by an inspector who is employed by the school district to inspect that that building is built to that specific plan check document.

Next slide, please.

Currently DSA enforces only structural, life safety, and accessibility -- I could have looked on the next slide. Manufacturers may not understand that Title 24 applies to them, and this is because -- historically there has been some ambiguity as to whether this is clear to the manufacturers. And DSA has sent a memo to manufacturers, or I think -- I believe they're going to send a memo to the manufacturers to clarify this item.

And inspectors, both DSA does not have inspectors who are trained in Title 24, and the factory inspectors are not trained in Title 24 enforcement. So there is not a lot of knowledge throughout the chain, as far as making sure that the standards are followed.

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So our recommendations for improving the process is to clarify that DSA is the appropriate agency to do Title 24 enforcement, to make sure that school districts, architects and manufacturers are aware that relocatable classrooms must meet Title 24 standards. And also to assist in training of the factory inspectors, add to their current training in structural and life safety, and add an energy component to their training so that they can verify that relocatables are actually being built to the new standards.

And that's it, thank you. Questions?

CONTRACT MANAGER ALCORN: Thank you, Leo.

Are there any questions or comments?

Dave?

MR. WARE: Dave Ware, Owens Corning.

It seems like, in the measures that you analyzed, you -- or correct me if I'm wrong, but you didn't play around with the configuration of the base building to maximize the energy efficiency.

MR. RAINER: Right.

MR. WARE: I mean, even within the size, typical size, it seems like you assumed a typical nominal two-by-four framing assembly and went from there. So one comment I have is did you look at R15 insulation as opposed to just R13 insulation?

MR. RAINER: I don't know if it went to R15. We looked at R19.

MR. WARE: Okay, you did look at R19?

MR. RAINER: We looked at R19 with a

six-inch wall.

MR. WARE: Yeah.

MR. RAINER: And that didn't work out. I don't think we looked at R15. I think we looked at high density and we looked specifically at improving the insulation of the roof beam, but we didn't look at -- go to the next step.

MR. WARE: Okay.

MR. RAINER: So it's possible there's an incremental --

MR. WARE: And that's what my comment was. I wasn't sure why you didn't look, at least from the table it wasn't evident that you looked at and had any consideration of an R15 in a two-by-four situation or R19 or R21 in a two-by-six situation. You didn't talk about, or at least I didn't pick it up, framing. Was it 16-inch on centers or 24 on centers, and that can move the cost-effectiveness numbers, depending upon what those assumptions were based on and the insulation numbers.

So, you know, I think it would be more clear, that you might indeed find that you could improve the efficiency if you add extra insulation if some of the framing assumptions were different.

MR. RAINER: There is a lot of opportunity, actually, for improving the framing here, because all of the structural load is carried by the -- at least in the steel frame --

MR. WARE: Right.

MR. RAINER: -- all the structural load, just the wind load is all the wall has to maintain. And so there should be a real opportunity to go to 24 on center, but we didn't look at that.

And you could possibly do that just by mandating a lower U value, and they could meet that however. They could meet it with exterior foam or reducing framing if they got credit for reducing that framing.

MR. WARE: Exactly, and that was -- You beat me to the punch. You could accommodate what you're trying to do by you're going to capture this, the proposal to capture this within the standards, and so one way to achieve that is just to establish a U value statewide and let them figure it out.

MR. RAINER: Yeah. We tried to stay statewide so we couldn't push the wall. You'll see the wall is already marginally effective in some of the climate zones, so it's going to stop -- in some of the climate zones it's going to stop working.

MR. WARE: Yeah, and some of my comment, just to put some context to it, is not in the vein of trying to actually improve or sell more insulation, but we have been actively involved in the acoustic portion and the learning portion of classrooms in general, both portable classrooms and base-built school facilities. And so there is a real link between noise and learnability.

And so, for better or for worse, the combination of materials, both absorbing insulation materials and hard materials, really can improve not only energy efficiency but actually improve the learnability that's in there. And so if we could accommodate or kill two birds with one stone, that would be wonderful, since there seems to be a movement to bring classrooms into the genre of the energy standards.

MR. PENNINGTON: What did you say, you said insulation materials and some other type of materials?

MR. WARE: Rigid-type materials. From

a noise perspective or sound control --

MR. PENNINGTON: So finished material you're talking about.

MR. WARE: -- the combination of those things helps. There's a law of diminishing returns to the amount of absorbing materials that you can put, but you still have drywall and you still have an exterior surface on the building, and you've noted in your report that it's either a wood or steel. You know, you could -- It's possible to maximize both the efficiency elements of that exterior in combination -- finish interior items and accommodate energy efficiency and noise-level reduction as well.

It's not necessarily outside of the scope of what you're doing, because they are a combination of the things that deal with energy efficiency.

The other comment I have is you had the slide that showed the three things that you're doing and the last bullet was overcoming enforcement barriers, and you alluded to the fact that DSA really has the authority to do this, and I know it's maybe premature to say just what you're going to do with DSA, but that is really tantamount -- it's one thing to capture this in the code, but, you know, there is no budget to train those people. You know, they're not even coming over here to talk to you people, all of this is moot.

But I certainly support the step in the right direction. This is the first step.

MR. RAINER: I should emphasize that DSA has been very helpful and has reviewed the report and is very interested in participating in this, and they would like the opportunity to have the support of the Commission behind their enforcement of Title 24.

I think the -- I do want to emphasize that none of the package improvements will occur, if there isn't -- the enforcement doesn't happen, but I think there are a lot of interested parties improving that process.

MR. RAINER: But we have had that interaction with DSA in talking about this report and talking about them making it clear that part six applies to schools of all types. And in their building coded options that they did in 2001, that was clarified for the first time, that part six does apply to schools, even though that always was our intent. And that was an interpretation that they had previously made. It's actually in law now.

And they're intending to move towards a training program that will train on this, get their inspectors trained, and provide a mechanism that plan check can get done on this. So actually, it's really very good news for us, going from nothing to just current standards being enforced is a huge step. And then this change is, as you know, an incremental change beyond that.

MR. WARE: I agree, and one last comment, the way the procedure would work, it's a prescriptive package for classrooms, so the mandatory measurements would still apply. So other than the restriction for glazing tradeoffs, it's possible to use any of the other compliance options available, down to the mandatory measures, and that would include -- I was going to say that includes RA ducts, although it's somewhat moot in the sense that it's a sidewall-mounted unit anyway, typically.

Okay. So that's correct in my assessment? You still do all the other tradeoffs, down to the mandatory measures, aside from the ten-percent glazing.

MR. RAINER: Yeah, the intent of the simple prescriptive package was to encourage manufacturers to use that in order to simplify enforcement. But all of the other options are still open.

MR. PENNINGTON: Our view, in terms of performance standards compliance, is that for that to be relevant, they need to know where it's going, what climate zone it's going to, and they need to know how it's going to be oriented on the site. And in general, they don't know those things.

They could do a worst-case analysis and they could say we don't know what climate zone it's going in, so we'll analyze all of them and figure out what's the worst case. And we don't know what orientation it would be, so we'll analyze, you know, 15-degree increments around the compass and figure out what's the worst case.

But, you know, it's our expectation is that that probably is not going to be how people are going to want to comply. They're going to want to have a prescriptive kind of approach in general.

MR. RAINER: It's an opportunity for CABEC.

MR. ELEY: Charles Eley. Leo, from what you've said, these HVAC systems are so noisy that the teachers turn them off when they have to conduct class; is that correct?

MR. RAINER: I shouldn't say that -- No, if they need conditioning, they leave the units on, but they won't leave them in fan mode. I've yet to see one with the fan running and fan on; they'll leave the fan in auto.

MR. ELEY: Okay. Do these units bring in outside air?

MR. RAINER: They are supposed to bring in outside air. It depends on the type of -- The default wall unit comes with a damper that brings in about -- I'm trying to think of what -- 25 percent of duct flow, and you can option that will go up to 50 percent of flow, but for --

MR. ELEY: And what's the flow?

MR. RAINER: About 1200 CFM, depending on the size of the unit.

MR. ELEY: Okay. So the standard is --

MR. RAINER: 400 CFM for a 30, or 465 CFM for a 30-person classroom.

MR. ELEY: Okay. So that would meet the outside air requirement.

MR. RAINER: If they have the 50 percent. If they have the classroom, the commercial room ventilator, which is a power damper. If they have just the manual barometric damper, then it will be 25 percent of flow.

MR. ELEY: And that would not meet the outside air requirements.

MR. RAINER: And so if they have, let's say, a three-and-a-half-ton with a barometric damper, it wouldn't meet it. And that does happen; it isn't necessarily the majority.

MR. ELEY: So this is, I guess we can say, a less than ideal system for classroom environments. It's noisy and doesn't provide adequate outside air ventilation.

MR. RAINER: Yeah.

MR. ELEY: Did you look at any other options that maybe could be explored that have better acoustic qualities and better ventilation effectiveness and --

MR. RAINER: Well, the commercial room ventilator options does provide enough flow. There are some commercial quieting options on the through-the-wall return, which basically is kind of a wall that that goes down and moves it to a floor return, and gives you a little bit of separation. So we looked at those, we didn't analyze them.

And a number of people I think have looked at split systems for these, and it's hard to do a split system on these because there's no place to put the condenser, unless you want to put it on afterwards, and that's a big issue. They really want to stay away from any sort of site labor on these.

MR. PENNINGTON: Related to this issue that you guys are discussing here, what I'm imagining that we'll do is that we'll have acceptance requirements associated with relocatables, and that that will be covered by Jeff Johnson's work and that we'll be enforcing current requirements related to outside air and the standards, which might cause there to need to be a change in both the thermostat and maybe how the outside is being done.

So I hope you're still on line, Jeff.

MR. JOHNSON: Yeah, I am.

CONTRACT MANAGER ALCORN: Okay.

MR. JOHNSON: Yeah, I'll just speak to that comment. I think that's one of the things that we see is that the structure of the assessment testing be well within the scope of these requirements and also within the inspection process of doing factory-based inspections.

And so we're currently expanding the scope of our work to be able to interview some of the folks at these factories, look at what steps they're taking, and then also map the standards requirements in the relocatable environment so we can get the assessment testing done at the factories.

CONTRACT MANAGER ALCORN: Okay. We've got some comments from Noah, Tom Trimberger, and Ahmed after that, and Greg Ander.

MR. HOROWITZ: I'll be quick. This is Noah Horowitz from NRDC.

Leo, I think this is a great piece of work and important, given that we're not only talking about saving energy but providing better learning environment.

A couple of thoughts relative to DSA: If any additional help is needed, either pats on the back or gentle advocacy, we'd be willing to help there, so let us know what the appropriate thing and we can engage our members.

MR. PENNINGTON: Just a comment on that: The current state architect is very aggressive on this, and wants to get -- wants to bring their agency, you know, current. And that's really good, so --

MR. HOROWITZ: So if they need additional staff for enforcement or whatever, we can Possibly help.

MR. PENNINGTON: Right.

MR. HOROWITZ: In terms of the incremental costs that's $5- to $700, just doing back of the envelope calculation here, how does that compare to the base case? Does it cost $5,000 and we're talking about a ten-percent adder, or --

MR. RAINER: Total cost is $50,000, I think.

MR. HOROWITZ: Okay.

MR. RAINER: I'm not sure if that includes site work.

MR. HOROWITZ: So we're at one percent of the cost or something like that?

MR. RAINER: Yeah, it's very small.

MR. HOROWITZ: Is that still potentially a barrier? Do the school districts simply look at first cost or is the cost-effectiveness so sexy that --

MR. RAINER: Districts look at first cost, and that's what's the hardest thing. We've tried a number of projects to encourage districts to ask for efficiency measures. One problem is that adding an efficiency measure to a relocatable costs a lot because it's not the standard and this is a kind of a production line item.

And so if they have to design nonstandard or if they have to order from a nonstandard supplier, that's why something that's included in Title 24 and has to change over all the relocatables, the cost goes down. But it's still first cost to districts.

I don't know what their response would be to find out that it would be $500 more for the relocatable, even though they could recover it in the first year from a different budget.

MR. HOROWITZ: What would be great, then, is whether it's in here or the measure analysis, to say it's $500 against $50,000, and statewide the state can save this much dollars for the schools and so forth. Thanks.

CONTRACT MANAGER ALCORN: Thank you.

Tom?

MR. TRIMBERGER: Tom Trimberger from CALBO.

For state-owned public schools, DSA is the authority having jurisdiction of, in effect, the building official. We do inspection, however, for private schools where they use these. In this case it is -- the building itself is installed like an appliance. We have the utilities that connect to it and the foundation that connects to it. Other than that, it's a preapproved unit. You come stick it in.

Are those still inspected? You know, you said it's inspected by the district, employed by the inspector, or the school district hires the inspector. What if there is no school district? How is that enforced then?

MR. RAINER: Well, if the purchaser should -- I don't know how it works with a private school, actually.

MR. TRIMBERGER: Okay.

MR. ELEY: Well, I think they can -- Excuse me. The private school can buy off of someone else's specification contract.

MR. RAINER: Piggyback.

MR. ELEY: They'd say I want one like Los Angeles Unified School District purchased, and Aurora, whoever the manufacturer is can just okay, I'll deliver you one of those. Here is the price.

MR. TRIMBERGER: Yeah, essentially it's called a commercial coach. It's a state-inspected, it's like, you know, having your car licensed. You know, you don't get it from jurisdiction to jurisdiction, but just, you know, I don't know how many -- you said 3,000 of them per year. I don't know how many of those are public school versus private, but private do use them also.

I just wanted to -- I don't have any authority over them, but however you wanted to look at enforcement.

MR. PENNINGTON: So you think that HCD has authority over them through their commercial coach requirements?

MR. TRIMBERGER: No, I don't know exactly. I thought -- I was thinking HCD, but that's housing, so I'm not sure --

MR. ANDER: I think it is HCD.

MR. TRIMBERGER: Is it still that? Okay.

MR. RAINER: The non-DSA are typically HCD.

MR. ANDER: I think it's coming from OPSC. They develop specifications, Office of Public School Construction. They develop kind of standard, canned performance specifications, and bulk procure 2- or 3,000 units a year, so the comment I wanted to make is that's an organization you also may want to engage in a sole process. They're very involved in the procurement and placing of relocatables throughout the state in large numbers.

MR. PENNINGTON: I think they're about ten percent of the total or something like that?

MR. RAINER: Yeah, but the numbers I had were more like 300.

MR. PENNINGTON: Yeah.

MR. RAINER: But I'll have to look. We have -- I don't know if we've actively, I know they're aware of the work right now, and they definitely, their specification is much better than the typical. They have demand control ventilation. They have better lighting and better insulation, so their package is quite good.

That's specifically for lease to schools, so it's a lease fleet that their purchase is for.

MR. ANDER: I know oftentimes schools will contact them, if they don't have a specification of their own, and they'll grab that spec and shop that out as well.

MR. RAINER: Yeah.

MR. ANDER: But I was going to mention, Commissioner Pernell is very involved as a board member and officer of the Collaborative for High-Performance Schools. Louisa Park, who is the head of OPSC, is also on the board, so there is a good connection there with the Commission to make that contact.

MR. RAYMER: And Steve Castellano, who is the state architect, is on the board too.

CONTRACT MANAGER ALCORN: Tony, we'll come to you in a moment. Ahmed and then Tony.

MR. AHMED: I'm surprised, Leo, you did not include duct insulation as part of it, because some relocatables for schools are built with ducts. In fact, I just finished designing two buildings for LA Unified School District. They're two-story relocatables made by Aurora. They have ducts and also they have rooftop air conditioners instead of the barred systems on the end wall.

So I think it will be a good idea to have duct insulation as one of the prescriptive requirements.

MR. RAINER: Yeah, I don't want to make it sound like the one we looked at is the only relocatable classroom. There is an infinite variation and there are two-story. There are ducts actually, even in the single-story. The ones we looked at are ducted in the supply. The return is through the wall, but there are typically two or three supply ducts, but they are basically in the conditioned space. They're in that plenum area, and the insulation is above them.

And there usually are insulated flex duct, but the improvement, increasing that level would be very marginal, because it's basically conditioned space, not that it -- Right now there is the uninsulated roof beam, but if it's built well, that should be in the conditioned space.

MR. PENNINGTON: I would add that the other nonresidential requirements apply to them as well. You know, this is a list of things that were specifically evaluated, but duct insulation apply to them, HVAC controls apply to them, you know, all the mandatories apply.

MR. AHMED: Right, and these buildings that I designed, I just finished designing two of these buildings, and the specs from the school districts did not require any of these Title 24 requirements. The only thing they insisted was that the units must be SEER of 10. That's all.

MR. RAINER: Well, see, they were obligated to comply, but --

MR. AHMED: I know --

MR. RAINER: -- but now we're clarifying, you know --

MR. AHMED: Yeah.

CONTRACT MANAGER ALCORN: Okay. Tony?

MR. PIERCE: Tony Pierce with Southern California Edison.

Leo, you commented that split systems didn't seem to be a viable option because of a problem, I think what you're saying, a problem with the condensing unit having to be located at grade or outside of the classroom.

MR. RAINER: I have seen ideas of

putting the condensing unit either in a closet or somehow mounted on a -- and the problem is, you can't put it on the roof, because it's got to fit down the road.

MR. PIERCE: Right.

MR. RAINER: And if you could put it in a closet or in a sidewall with air, I could see that as a possibility.

MR. PIERCE: And that's what I wanted to comment on. Southern California Edison worked with one of the large manufacturers of relocatables in California, and we have a prototype at our technology center in Irwindale, and we've done just that. We've taken the split system, and we think that it helps in the HVAC for the relocatable in a number of ways.

It certainly helps separate the air flow so we have much better acoustics. We expect that, and our recommendation is certainly to be code-compliant in terms of maintaining ventilation air stream. And you can also go well beyond the efficiencies that are available in the wall mount, so we can go to a 14 or 15 SEER easily as opposed to topping out at somewhere around 12 SEER for the wall mounts.

And so we can put this into that closet space. It ships down the road. At the factory, the factory charged, once electrical is made up to the relocatable, might have some shipping hold-downs. Once those are removed, it's the same as the wall mount in that respect. It's the portability, I suppose.

So the benefits we think are -- and what we're demonstrating in terms of acoustics, better energy performance as well as maintaining this sort of vandal-proof system where we don't have a remote located condensing unit.

CONTRACT MANAGER ALCORN: Thank you, Tony.

Are there any more comments on this topic before we move to the next presentation?

Ahmed?

MR. AHMED: Yeah, one last comment.

The reason the relocatable manufacturers don't like split systems is because they ship the units with the ducts in place with the rigid ceiling to the site, and, therefore, they would rather have the unit sitting on the side than having to do the construction work on site. They want to minimize the construction work on site.

So that's the reason they don't like the split systems.

MR. PIERCE: Well, just a response to that: Our prototype design is all factory-installed, the HVAC -- It's a three-module design, so the footprint is square as opposed to rectangular. All of the HVAC is in the center module, all factory-installed, shipped to the site, no field labor.

CONTRACT MANAGER ALCORN: Okay, thank you, Leo, very much.

Let's move on to the next topic here, which is improvements for existing light commercial buildings. Jon McHugh is the presenter.

Jon, if you're ready?

MR. MATTINSON: Bryan, are we skipping the nonresidential --

CONTRACT MANAGER ALCORN: Oh, forgive me, I'm sorry. Forgive me, I jumped ahead. I apologize for that.

Pete? Pete, I'm sorry, I --

MR. JACOBS: No problem. I thought you wanted to perhaps rearrange the agenda.

CONTRACT MANAGER ALCORN: No.

MR. MATTINSON: Sorry to mess you up, then, Bryan.

CONTRACT MANAGER ALCORN: Thank you, Bill, for pointing that out.

MR. JACOBS: All right. I'm here to present duct sealing and insulation for nonres new construction, and then Jon will follow soon thereafter to talk about duct sealing in existing buildings. But these are two related topics but with different populations.

Okay, next slide.

Basically, we're making some incremental changes to the existing standards already. The current standards address duct sealing. They address them as a compliance option. And the applicability requirements are primarily single-zone unitary AC, air conditioners or heat pumps surveying zones of 5,000 square feet or less where the ducts are located outside of the conditioned envelope, primarily either running across the roof or in an interstitial space above an insulated ceiling.

The proposed change here is to make duct sealing and increase duct insulation part of a prescriptive requirement as opposed to a compliance option.

Okay, next one.

In terms of applicability, we're considering this change to basically mimic the existing standards. If you look at the 5,000-square-foot zone cutoff and you apply some nominal square-foot-per ton numbers, it basically applies to units that are 20 tons and smaller, so what you might call light commercial HVAC. And we're targeting light commercial as opposed to larger buildings, basically because the light commercial applications are basically pretty well aligned with residential, in terms of the way that they perform and installation techniques and designs. And in many cases they're just big residential systems.

The specific issue of larger systems, HVAC in large commercial buildings, is currently being studied by LBL under a PIER project that's underway, and my understanding is that they'll probably bring some co-change proposals forward for larger systems at some point in the future. Some of the applicable performance indices appropriate for large buildings are different testing methods and so forth.

So we felt that staying with the current applicability as mimicked in the -- mimicking the current applicability in the existing standards was appropriate for our task. And I think the main issue is that light commercial buildings wind up covering a majority of the cool floor space in the state. So this particular proposal does cover a good portion of the floor space.

Next slide.

This pie chart basically shows, by system type, the floor space distribution in nonresidential new construction. These data were derived from the nonresidential new construction database, and basically show that single-package DX air conditioners and heat pumps cool more than half of the square footage in the state. And if you look at the cooled square footage, there's actually a pretty decent chunk of that pie that's uncooled, probably more like two-thirds of the cooled square footage is covered by what we might call light commercial HVAC systems.

Next one.

Now, within the classification of

package single-zone air conditioners and heat pumps, I plotted up the cumulative installed capacity by unit size, and basically what this shows is that the majority of the cooling, installed cooling capacity is handled by units 20 tons and smaller. So I think the original intent of the standards, the AB 970 5,000-square-foot-cutoff criteria applied across this population data shows that it's pretty well targeted, and we make no -- we have no recommendation to change that at this time.

Next one.

In terms of energy impact, the impact of sealing ducts in nonresidential new construction I think has been well documented, certainly starting with the AB 970 proceedings and work that led up to that -- you know, approximately 20 percent annual cooling energy impact in buildings where the duct work runs through an unconditioned space.

And the thing that's, in terms of projecting that to the statewide level, and I think this is probably the most important part of this whole discussion, is that the numbers of buildings, at least on the nonres new construction side, that run the ductwork through unconditioned spaces, either along the roof or above the lay-in insulation, it's a little bit -- it's somewhat of an elusive number right now, but we're estimating somewhere between 20 and 40 percent of the population. It's certainly not a huge percentage, but it's not an insignificant percentage.

And that ultimately, the impact of this other proposal will depend on other things; in particular, the lay-in insulation proposal that's on the docket for the August workshop and also cool roofs that were already presented. The ultimate impacts of duct sealing will certainly be affected by whether the cool roof proposal is accepted.

Next one.

To do cost-effectiveness analysis, we basically, like many of these things, we built some computer models and calculated the benefits from an energy perspective of doing a duct sealing and increased insulation in a commercial context. We based our cost-effectiveness analysis on a prototypical office building. We used the DOE 2.2 program because it has some important enhancements in terms of modeling duct leakage sealing over the

2NE version that's a current compliance tool.

We based our assumption on a 36-percent total leakage, which was the average leakage rate recorded for a fairly large study done down in Southern Cal Edison territory last year, and when we say 36-percent total leakage it's a little bit of a misnomer. What that means is if you add up both the supply and the return leakage, it adds up to 36 percent of flow. So our analysis is basically 18 percent of the flow leaked out of the supply side, and with equal leakage on the return side, so basically 18 percent supply, 18 percent return.

Reasonable levels that are in the current standards are of eight percent total leakage in new construction for a sealed system. We did evaluate more typical commercial building operations using continuous fans, where the fans run continuously during occupied hours to provide outside air, and we looked at the sensitivity of the cost-effectiveness to the presence of air site economizers and also to cool roofs.

And all of our cost-benefit analysis was based on using the TDV procedure. We applied the TDV multipliers to 8760 hourly energy values calculated by the simulation, using the 30-year numbers as directed by the Commission.

Next one.

In terms of cost, for our prototype, for our 2,000-square-foot prototype, we had cost estimates of, you know, roughly $250 per system to do the sealing, so we've based all of our costs on a range. So I set the range at between $200 and $300 per system, which translates to about 10 cents to about 15 cents per square foot in our prototype.

To do the testing using a fan pressurization type test, a cost estimate of $150 per system to do the testing. If you do a 100-percent test -- you test every system -- that works out to roughly 7 1/2 cents a square foot for testing cost. If you do a one-in-five sampling, then it drops to, oh, about a penny and a half a square foot for testing costs.

In terms -- So those things taken together for our prototype we estimated a range for sealing and testing anywhere between $230 and $450 per system.

Similarly, for the insulation upgrade, going from nominal R4.2 to R8, we had a cost estimate of somewhere between a nickel and 7 1/2 cents a square foot for that insulation upgrade.

Next one.

In terms of cost effectiveness, basically this chart shows the TDV of the savings evaluated for different climate zones, and also for different operational strategies, either with or without economizers and with or without cool roofs. So the blue bars basically show the magnitude of the savings using the TDV procedure, and the little line that accompanies the blue bar is basically the benefit cost ratio, using the upper and lower end of the cost range.

So for that particular TDV savings, projecting that into the upper and lower range of the cost estimates, we show an upper and lower range of the benefit cost. And, as you can see for all of the climate zones and all of the operational characteristics studied, the benefit cost ratio for this was much, much greater than one. One is basically, well, halfway the first two grid lines, and the benefit costs are generally in the four to greater than ten range for certain cases studied.

Our analysis shows this to be highly

cost-effective in commercial applications.

Next one.

Similarly, we did an analysis with upgraded duct insulation showing the TDV of the savings for improved insulation for ducts running through unconditioned spaces or outside, and then calculated the range of the benefit cost ratio and showed that also this measure was cost effective at both the upper and lower end of the range under all the different combinations of climate, cool roof, and economizer operation that we studied.

Next one.

So in summary, we found that the leakage sealing, including the verification cost, is highly cost effective with the benefit cost ratios ranging from 2.6 to more than 7 in climate zone 3, and running from 5 to 14.5 in climate zone 14. So we feel this measure is highly cost effective when looking at duct sealing in ducts running through unconditioned spaces.

Next one.

We also concluded that increasing duct insulation from R4.2 to R8 is cost effective, benefit cost ratios a little less than 2 to 3.6 in climate zone 3, and from 3.6 to greater than 8 in climate zone 14.

Next one.

And basically, they're projecting the savings on a statewide basis -- It depends primarily on whether the cool roof proposal is ultimately accepted, and also the upcoming lay-in insulation proposal, which I think will affect how many buildings actually wind up getting built in new construction with duct work running through unconditioned space, if the lay-in insulation proposal winds up limiting those buildings, then naturally the number of buildings that would fall into this particular proposal would also be limited similarly.

CONTRACT MANAGER ALCORN: Okay, thank you, Pete.

Any questions or comments? Noah?

MR. HOROWITZ: Noah Horowitz, NRDC.

I think this looks real good. The devil is always in the detail, and I remember sitting through a lot of discussion of who is going to do the testing, are those people available.

MR. JACOBS: Right.

MR. HOROWITZ: Have you given thought

in terms of you mentioned a sample size of 20 to 100 percent. Do you have a recommendation of where within that spectrum you think makes sense?

MR. JACOBS: Well, I think the NRQA, the acceptance testing proposal, and Jeff is on the line, he could probably comment as well, but they were actually recommending 100 percent testing. I'm not saying that.

So Jeff, do you want -- do you have further comment?

MR. HOROWITZ: And who would be doing the testing? Do they need to be a HERS rater or --

MR. JOHNSON: Well, Noah, I can address that. There are actually two types of things going on here. One is acceptance testing, which would require the contractors to do 100 percent testing on their system and certify that they've done the testing and met the leakage requirements. No credit would be given, that's just something they may be required to do.

If they wanted to receive a credit for doing the testing, they would need to contract with or bring a third party person to come in and do basically a field verification of their testing.

So essentially, we're saying 100 percent, but what the proposal is that it would require 100 percent testing, contract it as attached. If you want credit, you have to bring in a third party individual to verify your field verification you're testing.

MR. HOROWITZ: So, Jeff -- This is Noah again -- under this, then, if they weren't seeking the credit, then, there would be no checking up to see if the contractor's test results are reliable.

MR. JOHNSON: That's correct, with the exception of them having to sign a statement that they did test and found those factors.

MR. ELEY: This is Charles Eley. In this case would a HERS rater be the one that would do this test?

MR. JACOBS: Well, I think that our intent is to expand the population of testers beyond just the HERS raters, and if this really takes off in a big way I imagine that HERS raters are not sufficient in numbers to really cover this.

Now, the caveat of that is that in order to get a good test, our team believes that the duct pressurization method is the most appropriate way to measure the testing. Natural constituencies for doing this type of testing for commercial buildings are the tested balance contractors, who right now base their testing on flow hood and pito (phonetic) tubes.

And so if they were to become involved in this and enter the marketplace, they presumably would need to add an additional test methodology to the current suite of testing techniques that they use. So I think ultimately, the way I'd like to see this go is to involve people that are more involved in the commercial marketplace, but also encourage them to adopt a test methodology that we feel is more appropriate for this type of work.

MR. JOHNSON: Yeah, maybe I could clarify something related to Charles' question. It's the truth, also, in many cases the contractors are using pressurization testing as a way of doing quality assurance while they're constructing the ducts in order to make sure that they can, that once the system is installed, it will, in fact, pass the test and a third-party person is going to be called in.

So the pressurization methods are

actually part of the tools of getting to tight ducts by the contractor. We have also found that even in large systems, pressurization seems to be the preferred way of doing testing. We've been in contact with some folks at Eastern Washington University that test very large sections of ducts using pressurization. They find that to be the most effective way to go.

MR. HOROWITZ: Just to respond to Jeff, I'd encourage the consultants and the CEC to take another look at simply that this is a mandatory requirement, allowing the contractors to do the testing and sign off. I think we might need another level of QA on that.

MR. PENNINGTON: I think there is some clarification that's needed here. In terms of the acceptance requirements, that testing would be done by whomever is appropriate that's working on the job that's related to this, whether it's the mechanical contractor or a test-and-balance company, whatever, that they would be the ones that would be doing the counterpart to the installer testing on the residential side.

And so, you know, that could be a number of parties that could be associated with an individual job. So that's the testing side.

In terms of the verification portion which would be probably done on a sampling basis most of the time, that verification would be similar to the residential and that there would be, you know, CHEERS would be supervising that, unless there was some other entity that gets created here somehow, but basically they would be the supervisor. And, you know, people could become approved to do the verification piece, whether they're HERS raters, they're doing residential and want to expand, or people that are working in commercial buildings that have testing skills to get approved to do the verification.

CONTRACT MANAGER ALCORN: Okay. Tom?

MR. TRIMBERGER: I have a couple of comments. As far as the verification -- Tom Trimberger with CALBO -- I can't really see how you're going to do any kind of sampling on this. First of all, each building is pretty much unique. There is no learning curve from doing the building repeatedly.

Secondly, in a residential production house environment, you have a project that you say in advance that you're going to do a hundred homes. Okay, what are you going to do for a commercial builder? They're going to do how many are you going to do this year? I don't know. Depends on how many contracts I win. And then are you going to sample the general's work, or would you be sampling the subcontractors' work? He may have more than one subcontractor on the job. There really isn't a way to define the project.

And then how are you going to go backwards on the commercial project if one fails? I think you really have to either go to 100 percent or you've got to find a way to determine some of these methodologies, but I think you'd have to go to 100 percent verification.

MR. PENNINGTON: The thinking on that was that for these kinds of buildings, you generally have a whole series of package units on the building, each of them serving a zone. And you could sample the package units on that given building and do it that way.

MR. TRIMBERGER: Okay, so it would be a different kind of sampling, then.

MR. PENNINGTON: If you have 50 units and zones on a building, then you could sample across those.

MR. JACOBS: You know, picture a big-box retail with, you know, 30 units on the roof. You wouldn't necessarily need to go to each individual one. A certain number of them pass.

MR. TRIMBERGER: Well, big-box retail has very little --

MR. PENNINGTON: And if you found a problem, then you could go backwards.

MR. TRIMBERGER: Okay. So it's not by building, you're looking at it by air system, you have to define that sampling protocol.

MR. PENNINGTON: That's the kind of thinking.

MR. DAY: Michael Day, Beutler.

First off, I want to say that we were taking a look at this and thinking that it's probably a pretty good thing, but we had a couple of questions, one of which is a followon to what we were discussing earlier, Pete, with regard to the test or to the price of the marginal cost of upgrading from R4.2 or R6 to R8. With the costs that you were showing here of $100 to $150 for a system that might be anywhere from five to 20 tons, that, at least from what we'd seen, was a little bit on the short side.

And also, with some of the transportation issues and labor issues, they would apply equally if not more so because of the larger average size and larger amount of duct surface area.

My question more comes -- My second question, though, has to do with economizers. When you were doing duct pressurization, how did you deal with the economizers and the barometric reliefs in the commercial system? What's the protocol for dealing with those so that when you pressurize the system you don't just go blowing out through the barometric relief?

MR. JACOBS: Yeah, I think the protocols are such that I think you wind up testing the supply and return side separately, and so clearly you would need to block off the outside air and the barometric relief to even achieve the test pressure.

MR. DAY: And that's something that comes up as, as some people know, we do a fair amount of economizer installation for residential systems throughout Northern California, and that's proven to be a major impediment to us getting tight duct certification, if we're on any system that takes a residential economizer.

So if there is a protocol there for dealing with economizers in the commercial realm, we'd really like to see that, maybe -- I don't know, staff could take a look at rolling that backwards to the residential side, because if it's nice and cool outside, there's no reason why we shouldn't get some free cooling. Thank you.

MR. PENNINGTON: And on the residential side, the requirement is that the unit be tested with the economizer damper closed, and if the economizer is too leaky to meet the test, then it doesn't meet the test. So you need to have a good damper on the economizer.

CONTRACT MANAGER ALCORN: Okay. Dave?

MR. WARE: Dave Ware, Owens Corning.

My comment is similar to what I mentioned before on the residential side related to ducts, that you proposed prescriptive requirements for sealing as well as duct RA. If it's so cost effective and the effective savings is so predominant to that building segment, why not make this a mandatory measure? That way you would not dilute the savings, projected savings that you would have on this because of building tradeoffs. You would achieve it across the board.

CONTRACT MANAGER ALCORN: Thank you.

Are there any more comments on this topic?

Hearing none, thank you very much, Pete.

Now we can get to Jon McHugh's report on improvements for existing light commercial buildings.

MR. McHUGH: I'm so happy you were so anxious to see this report, Bryan.

MR. ELEY: And we're almost on schedule.

CONTRACT MANAGER ALCORN: Yeah.

MR. ELEY: In fact, we're five minutes ahead of time.

CONTRACT MANAGER ALCORN: We're ahead of schedule. Thank you, Pete.

MR. McHUGH: So following on Pete's discussion that duct sealing and duct insulation is quite cost-effective in new buildings, when we look at existing buildings and we're upgrading the HVAC system on those buildings, it also makes sense to look at sealing and insulating ducts in those buildings.

So next slide, please.

The proposal that we've submitted is that for ducts that are outside the conditioned spaces or indirectly conditioned spaces and attached to a single-zone air conditioner or heat pump, that those ducts must be tested and sealed to a maximum of ten percent leakage when there is more than 25 percent of the duct surface being replaced or the attached HVAC unit is being replaced.

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And related to insulation of ducts, we're looking to have, that when ducts are being replaced, and those ducts are outside of conditioned spaces and attached to a single-zone air conditioner or heat pump, that those ducts be insulated to RA. And if those ducts are outdoors, that they must have a surface reflectance greater than 80 percent. So, you know, if it makes sense to have cool roofs, it also makes sense to have cool ducts.

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A lot of this work comes from research that has been done from testing and sealing 350 light commercial duct systems for Southern

California Edison. Of those duct systems, 85 percent of those systems, after they were tested, were found to be in need of duct sealing. Of those systems, the average combined supply and return duct leakage was 36 percent, and so it's sort of where this magic 36 percent number comes from.

Some of the data from other studies indicates that the typical supply leakage is 25 percent, and so if your supply system is leaking more than your return, then the duct leakage could depressurize your building, and this would have, of course, environmental benefits related to backdraft and those kinds of things.

From information that we had received from ARI, there are 140,000 replacement HVAC units that are being installed in light commercial buildings in California, and from work that had been done by Lawrence Berkeley Laboratory of ducts in light commercial buildings, 65 percent of those ducts are either external to the conditioned space or above an insulated ceiling, which are the locations where it makes sense to seal ducts. And if we look at those, put those numbers together, we find that there are potentially 74,000 systems per year that could be sealed upon the equipment replacement.

Also noting that when we do replace HVAC equipment, we are affecting the seal to the ducts, so this appears to be a great opportunity to upgrade duct tightness. In some situations, permits are being pulled for those things, and so then the authority of the standards would then apply. And so this is a good opportunity to get the savings from this type of measure.

Pete and I worked together on the savings from sealing ducts and insulating ducts, and we used the same 2,000-square-foot prototype, and it's -- for the work that we did on existing buildings we used the system that's described here. And I won't go into any more detail, since you all can read faster than I can talk.

But anyway, the comparison of tight ducts to leaky ducts is we assumed that leaky ducts leaked at that 36-percent leakage rate, that being an 18-percent supply leakage and an 18-percent return leakage, and that tested and sealed ducts could be sealed down to a ten-percent leakage.

So to look at the energy savings and

the cost savings from the benefit of sealing ducts, a DOE 2.2 simulation was performed. That resulted in hourly energy results, and the hourly energy was multiplied by the TDV energy factors, and just -- if there's anyone in this room that hasn't heard of TDV, it's essentially that energy is valued more on hot summer days when the utility systems are under peak load situation and energy costs more, and that the TDV concept is a present value calculation.

And in this case, we are looking at a 30-year period of analysis with a three-percent discount rate, and that the TDV savings is just the energy -- the TDV dollar usage of our base case, which is our leaky condition, and then we're subtracting off the TDV dollar consumption of our proposed situation with the tight ducts.

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And this first graphic is showing the TDV savings from duct sealing in a -- for various climate zones, and so the blue bar here is climate zone 3, the teal is climate zone 6; climate zone 10 is yellow, climate zone 12 is red, climate zone 14 is grey, and we have an average of all of those climate zones in black.

And what we see is that when we have a situation where we have insulation that is directly above the ceilings, we have R19 insulation above a ceiling, and then we have a vented attic, kind of similar to a house that -- and no insulation on that roof, that we find that the TDV savings are around $3500 for a 2,000-square-foot building. So over the 30 years, the discounted dollar value of the savings is at $3500. So about $1.80 per square foot.

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Now, we also wanted to look at alternatives to duct sealing, because in some cases there may be problems with sealing hard-to-access ducts, and so we wanted to have some alternatives that were of similar energy savings, and so the -- one alternative is to insulate the roof to R19 and to seal the roof vents. And we see that we have a similar level of savings if we do that.

Next, please.

And then finally, as another alternative we could insulate the roof to R10 and apply a cool roof or a high reflectance coding to the roof. So there are a couple of alternative tradeoffs instead of duct sealing, if that appears to be problematic.

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What we also looked at was, well, under what conditions is duct sealing cost effective? So we looked at a couple of situations where we had different sealing conditions. The last set was where we had an uninsulated roof deck, but actually in existing buildings you can see the situation where you have an insulated roof deck and also lay-in insulation at the ceiling level.

So then we also compared, again, the savings from tightening ducts in these situations, and, of course, the TDV dollar savings is substantially less, but it's still around $1000 benefit from sealing ducts.

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Here is another situation where the -- What this points out is that the energy savings aren't particularly greater or lesser when we have less ceiling insulation. It's actually slightly higher because we have -- Actually, there's what's known as regain. Some of that duct leakage actually reduces the load, the leakage in the attic space actually reduces the load on the conditioned space.

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And this one is a situation where we've added additional -- Let's see, we added R9, this is R9 roof insulation to -- This is where we added a cool roof, plus an additional R9 roof insulation to existing buildings, where we had I believe this was R19 also in the space. And this was also showing that even if we increased the insulation level at the roof deck and added a cool roof that there was still quite a bit of savings from sealing ducts.

Next slide, please.

And then this slide is showing us the TDV savings going from R4.2 to R8, and when we have, when the ducts are above a -- basically an attic space, where we have an R -- there is no insulation in the roof, but there is insulation above the ceiling, we have about a $500 a year savings. And when we have the situation where there is insulation both at the roof deck and at the ceiling level, the savings are substantially reduced to about $250 per year.

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I used many of the same costs that Pete

used in his analysis for R4.2 to R8 insulation, and here we were looking at 2,000 square feet with an incremental cost of $122. For the sealing of duct systems, most of this information came from that project with Southern California Edison where 350 or 300 sites were being sealed, and this came from the variety of contractors who worked on that project, who gave quotes that on average that you could seal these duct systems for $150 per ton, and the system that we looked at was a six-ton system, so that was $900, plus an extra $30 expected for third-party verification.

So finally, we took the -- we looked at the savings across the state and weighted them by the fraction of applications that had been found in the LBNL studies so that we had 60 percent of the spaces had vented plenums with lay-in insulation just at the ceiling level; the other 40 percent was unvented plenums, where we had both ceiling and roof insulation, and we also looked at fan cycling issues to come up with our average costs across the state.

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And just as I explained earlier, where we had that the costs for duct sealing and testing for a 2,000-square-foot space would be $930 for duct testing and sealing, the TDV savings averaged across the five climates was $2400. And if we added the extra $122 to bump those ducts up to R8, the savings are $1000, essentially, and that the TDV savings also increase somewhat so we end up with a savings of $2700 as compared to essentially $1000.

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Taking those, I believe it was 70,000 buildings across the state and multiplying those savings, we end up finding that there is a natural gas savings for each year after this proposal is adopted if people actually decided to seal their ducts. Or even if they don't, you know, there's going to be some similar-type savings from the alternatives. But that the savings would add up to 70 thousand, million BTUs per year in natural gas savings; 57 gigawatt hours per year for electricity, and 43 megawatts of savings each year.

Now, if you look at that over the next ten years between 2005 and 2015 and you start adding all that energy up together over the course of those ten years, we're looking at almost four million, million BTUs of natural gas, 2700 gigawatt hours of electricity, and 450 megawatts of peak demand. Now, that's a similar peak demand savings, or similar capacity that you would get from a medium-sized combined-cycle power plant, with all the headaches associated with siting and air pollution and noise effects. So this is a great benefit to the state.

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MR. ELEY: Is that a typo? Is that 43 or is it 430 megawatts?

MR. McHUGH: 430 megawatts peak demand over ten years, right?

MR. ELEY: Oh, over ten years, okay.

MR. McHUGH: Because each year we've got 43 megawatts, and so multiplied by ten, you get 430.

MR. ELEY: Okay.

MR. McHUGH: So this is just reiterating the proposal we talked about earlier, but just, again, that the proposal is to test and seal ducts at ten percent of fan flow if the ducts are outside the conditioned space or in a vented plenum or above an insulated ceiling, upon replacement of the air conditioning or heat pump.

Next slide, please.

And the alternatives that are proposed is that for buildings with no roof insulation, you know, this is again upon replacing your air conditioner, for those buildings with no roof insulation, the proposal is to insulate the roof to R19 and to seal the roof vents, or to insulate the roof to R10 and apply a cool roof coating to the roof and any exposed duct work, and of course, you would also seal the roof vents in this option as well.

And then for buildings that have some roof insulation, so a roof insulation greater than R5, you would be required to add R10 roof insulation and a cool roof coating to the roof and any exposed duct work.

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So for any new or replacement ducts added to an existing single-zone air conditioner, if those ducts are outside of the conditioned space, then they need to be insulated to R8, and those ducts that are outdoors need to have a surface reflectance greater than 80 percent, and they also need to be sealed and tested to ten percent leakage.

And the sealing and testing is only required if that newer replacement duct work is greater than 25 percent of this surface area of the entire system, so we're not going to require that you -- you know, if you're just changing a small section of duct work, we're not going to make you test the whole system.

So time for questions or comments.

CONTRACT MANAGER ALCORN: Michael Day.

MR. DAY: Michael Day with Beutler again, although it's my first time with them. John and maybe Pete as well, I was wondering, where were you getting your prices for the upgrade from standard duct work to R8 on the marginal costs? I know that Dave had been working with you on some of that. I was wondering if you had any other sources for some of those prices?

MR. McHUGH: Right. Now, I know Mark Madera has been involved in this as well, and he had been talking to his contractors, but I believe that Dave was one of his primary sources for insulation. Are you aware of other sources?

Actually, as I remember there was a -- he had talked with, I believe it was five, just -- we had also received quite a bit of help on this from Mark Madera, and I feel it's appropriate to acknowledge him on that.

MR. WARE: I want to say there's about five, five or six different places, and Bruce Wilcox had contact as well. And, I don't know, maybe I have that listed somewhere Mike, but we could give you that.

MR. DAY: Sure, that would be great.

MR. JACOBS: Yeah, because I remember there was more than just one.

MR. DAY: Okay, great, and Pete, you were working with basically the same information there?

MR. JACOBS: Exactly.

MR. DAY: Okay, thank you.

MR. JACOBS: We were consistent across the reports.

CONTRACT MANAGER ALCORN: Tom?

MR. TRIMBERGER: Tom Trimberger with CALBO. Is this looked as a prescriptive measure or mandatory measure?

MR. McHUGH: Prescriptive measure.

MR. TRIMBERGER: Okay. There are -- You know, there are certainly a lot of opportunities for energy savings. You showed building and account codes call for equipment to be accessible a lot of times, so you can change it out. A lot of times even that's a challenge.

There's no requirement for the ducts to be accessible. Sometimes you just cannot access a duct to fix a leak without doing some serious destruction along the way. Similarly, if most of the square footage that you looked at in light construction is going to be -- have T-bar ceilings, have you tried to do any testing on a T-bar ceiling? How do you seal that?

MR. McHUGH: How do you seal the duct?

MR. TRIMBERGER: You've got to seal the register to do a pressure test. How do you seal that?

MR. McHUGH: Well, actually, Mark is more of an expert at this than I am, but my understanding is that it's very -- in terms of testing the system, it's very similar to testing a residential space where you're sealing all the registers and pressurizing the ducts.

MR. TRIMBERGER: But with the T-bar ceiling, you've got a one-inch strip all the way around that you're going to have to seal to. That strip is a moveable thin piece of metal that you've got to seal to. I think it's going to be, you know, in a word, impossible. I've never heard of anybody being able to do it.

MR. PENNINGTON: Well, I think -- A couple of comments. I talked to Mark about your concern, and he said that, you know, he's talked to a lot of people that have done this work and there hasn't been an issue with this.

MR. TRIMBERGER: Have they done T-bar -- I know --

MR. PENNINGTON: Yeah.

MR. TRIMBERGER: Well, have they done T-bar?

MR. PENNINGTON: That was one thing I was going to say. The other thing I was going to say is, Craig, I wonder if you might want to respond to this or if you have any information about this?

MR. WRAY: Sure will. Craig Wray from Lawrence Berkeley National Lab.

We do a lot of testing in light commercial and large commercial buildings on T-bar ceilings. As a matter of fact, we might be doing some tonight. We haven't had problems sealing to the edges.

I know Mark is using one technique where you slide in plates to cover the register and then just uses tape around the edges. We often use cardboard, some tape, and maybe a bulb to hold it up. It's not really a problem.

MR. TRIMBERGER: So you're sealing the, you're taping over -- to the one-inch flange over the register?

MR. WRAY: Yes.

MR. TRIMBERGER: Okay.

MR. WRAY: You're not using very high pressure..

MR. TRIMBERGER: Right.

MR. WRAY: We haven't had problems with it blowing off. We have more of a problem with residential construction than we do in commercial.

MR. TRIMBERGER: Craig, but then you've got, in residential you have a substantial register attached through sheet rock rigidly to a rigid member, rather than a register that is basically laid on top of a one-inch strip of metal.

MR. WRAY: Yes.

MR. TRIMBERGER: And it works?

MR. WRAY: It works.

MR. TRIMBERGER: Good. Okay.

Another thing that concerns me regarding this, besides being able to access, is the whole nature of commercial changeouts. They're generally, you know, somebody's air conditioning goes out in their office retail, it needs to get changed right away. Residential, maybe you could wait a couple of days, typically. It's always a rush.

But in a lot of cases, commercial -- you know, the tenant has a problem, they call the landlord, the landlord sends their technician up there, yes, it's broken, can't be fixed. They call their subcontractor, heating/air company, and they can go out and change it for a couple of hours or whatever, depending upon the -- you know, any duct changes that -- you know, any -- make sure the plenum is lined up, if it's a like for like unit, it's real easy to do.

It's one contractor. You know, they might have to hire a crane for 90 dollars and stick it up on a roof. If we're going to this, we're looking at some extensive sealing which is invasive to the property where they're in. You know, rather than somebody just working on the roof and sending in one technician with a screwdriver at the thermostat, you've got people crawling around the space. You've got people poking up through the attic, things like that.

Or you have a second contractor to do insulation. Again, it's invasive to the space. Or you've got a third contractor doing a roofing resealing, which my experience with commercial property managers, they're real particular about their roofs. I don't see this being very attractive to people to use. As a prescriptive measure, where you can replace like for like, why would somebody -- I don't understand how that works for a prescriptive measure. If you're not required to do it, when would they do it? They don't need to show compliance.

MR. McHUGH: Why wouldn't they need to show compliance --

MR. TRIMBERGER: Right now you can take out a five-ton unit and put in a five-ton unit. You don't need to do any calcs.

MR. McHUGH: Right, but now that they would -- Since this would be a new requirement, they would now need to show that they had sealed the ducts in areas that are unconditioned.

MR. TRIMBERGER: So this would be a mandatory measure.

MR. McHUGH: Well, they could do something to trade off, but in general, it ends up being almost a mandatory measure.

MR. TRIMBERGER: So they would have to do either the sealing or the insulation or the roof sealing? So they would be required to do something like this.

MR. McHUGH: They would be required to do something to make up for the difference.

MR. TRIMBERGER: I think you'll have a lot of difficulty with this.

MR. McHUGH: Yeah. One thing to remember is that for a lot of buildings, they are going to have already R19 at the roof deck. And so there is a substantial fraction of building stock that this isn't going to apply to.

It's for all those buildings that aren't insulated at the roof deck, that either have lay-in insulation or were built long enough ago that they just didn't have that insulation. You know, the bottom line is that the cost of them sealing their ducts is low enough that it pays for itself and that there is this great benefit to the state.

And so if those ducts are in exterior areas or they're in an attic space, we're talking about that there is a four-to-one benefit cost ratio. So there is this great benefit to doing this. You know, newer buildings, when their equipment fails, in general they're not going to have to do anything because they have that R19 up at their ceiling level or the roof deck, and so it's only for those buildings where they're really going to get whacked on an energy perspective if they don't fix their ducts.

MR. TRIMBERGER: Yeah. You know, somebody comes to me and says, okay, I need this permit, I'm changing out this unit, what is it? Well, it was a five-ton gas back, I'm changing it over to a five-ton gas back. Right now I can say okay, fine, here is your permit.

MR. McHUGH: But now there's a --

MR. TRIMBERGER: Now I'm going to say, okay, where are the ducts? I don't know. What's the roof insulation? I don't know. You know, it's -- you know, you haven't factored into the equation the cost of the disturbance to the tenant. I certainly can't argue the savings. You know, the savings are there, but it's a highly intrusive measure.

MR. FERNSTROM: Gary Fernstrom, Pacific Gas and Electric Company.

I think you make a good point, Tom, about maybe the difficulty of implementing this. But oftentimes in commercial situations, you have a split incentive situation where the property owner may not be paying the electric bill, but may be responsible for heating and cooling. And I guess I'd have to say that they're insensitive to the cost implications for the tenant in that case.

So we need to be mindful of the utility bill savings and the benefit as it trades off against the inconvenience and difficulty of implementing these things. And John has pointed out there is quite a significant savings.

MR. TRIMBERGER: Yeah, I agree, the inconvenience is to the person paying the bills.

MR. WALKER: Good afternoon. Chris Walker with California SMACNA, Air Conditioning Contractors National Association.

I just had a quick question. To what extent are you relying upon the aerosol sealants to seal these systems?

MR. McHUGH: The quotes for sealing came from not only the air seal method, but also alternative methods. So, you know, we didn't want this to be basically requiring some kind of proprietary sealant method.

So as part of this we've gotten quotes for alternative methods.

MR. WALKER: Do the aerosol sealants meet UL 181, UL 181(a), and UL 181(b)? Do you know what they're --

MR. McHUGH: I'm not conversant with those standards.

MR. WALKER: Okay. The concern that National SMACNA has raised is that these sealants may cause a problem with some of the components within the duct systems. These would include dampers, controllers, sensors, etc., and they're very concerned about the tackiness, the tacky residue that's left behind, and how they would affect these systems. Has this been addressed in --

MR. McHUGH: Well, remember, there are alternative methods that could be used to seal ducts, so that is not necessarily an issue for this particular measure, so if you used air sealed, then you'd have to address those issues.

MR. WALKER: The air seal is cheaper than the alternative methods.

MR. McHUGH: But these values used were, I can provide some cost data for you later on.

MR. WALKER: Okay. It was just a concern raised by National SMAC and I wanted to bring it to your attention.

MR. McHUGH: Sure.

MR. WALKER: And thank you. We'll be providing further comments in writing. Thanks.

CONTRACT MANAGER ALCORN: Okay. Tom?

MR. TRIMBERGER: He raised a point too, I hadn't thought of that, that commercial insulations have, you know, if there's fired ampers and somebody sprays air seal, they're replacing some stuff for me and it's gone. I have big issues with that.

CONTRACT MANAGER ALCORN: Dave?

MR. WARE: I'll leave the air seal issue alone --

(Laughter.)

MR. WARE: -- although maybe we can talk about that offline. But the more important thing that I wanted to get clarification on -- Dave Ware with Owens Corning -- we've said the words mandatory measure and prescriptive requirement, but the proposed language that is in the report it clearly seems to me if you're adding a new section that it's a mandatory measure.

And the reason why I say that is there is no language being proposed that tells anyone where to go if they don't do those things or to get a tradeoff. There is no reference to a package, there's nothing. So it's not really --

MR. PENNINGTON: It's built into the part of the standards that deals with alterations which, you know, if you recall that, has both prescriptive and performance options within that, and this goes into the prescriptive portion of the alterations section for nonres buildings.

So the performance approach is always available as well.

MR. WARE: Okay. So in order to get the full context, you need to look at it in that context then.

MR. PENNINGTON: Right. So this is not over in the 120 section where all the mandatories are, it's in the 149 section where the alterations provisions are, and 149(b) in particular is the performance, or the prescriptive.

MR. WARE: So presumably in the other section regarding alterations, there would be some new language that would say, that would reference this new section as well, so that there would be some tie, because that's part of what I'm missing here.

MR. PENNINGTON: Yeah, (a) is relating to additions and (b) relating to alterations. And it says this is in the prescriptive approach for alterations.

MR. WARE: Okay. It doesn't say that, I mean, that's --

MR. PENNINGTON: Oh, I'm sorry, you're reading from the standards, yes.

MR. WARE: Okay.

CONTRACT MANAGER ALCORN: Was that all, Dave?

MR. WARE: Yeah, that was my comment.

CONTRACT MANAGER ALCORN: Bruce Maeda?

MR. MAEDA: Bruce Maeda, CEC staff.

I want to make a couple of comments. First, anywhere where high reflectance is mentioned, 80 percent reflectance you also need to mention MENS criteria as well. And secondly, when your benefits, where you averaged over climate zones, it's critical what the range of that or the standard deviation of those benefits are because in some climate zones it might not be cost effective; in some others it might be highly cost effective. And when you're averaging out, that's not appropriate, basically.

So the question is what is the standard deviation of the benefits?

MR. McHUGH: Okay. I can provide some written comments on that.

CONTRACT MANAGER ALCORN: Okay. Are there any other comments on this topic?

Okay. Seeing and hearing none, Jon McHugh, thank you.

MR. McHUGH: Thank you.

CONTRACT MANAGER ALCORN: Let's move on to the next topic, which is bi-level lighting control credits, and Lynn Benningfield will be presenting that topic.

MS. BENNINGFIELD: I'm Lynn Benningfield with the Heschong Mahone Group, and I'm here today to talk about encouraging the use of bi-level illumination in nonresidential occupancies. This proposal is based on a very simple concept, which is turn off the unneeded lights, and don't automatically turn on all available light as a default condition.

Next slide, please.

The purpose of the proposal is to promote use of multi-level lighting in areas that are intermittently occupied or areas where less lighting might be available as a default condition. And we're looking at three different spaces types for this proposal. One is small offices and classrooms -- Actually, that makes it four, doesn't it? But we lumped together the proposed requirements for small offices and classrooms, the corridors, and library and warehouse stack areas.

And instead of proposing a mandatory measure, we're proposing a power adjustment factor. And the power adjustment factors are an existing mechanism to provide credit for lighting controls.

Next slide, please.

Just as a reminder, power adjustment factor is a credit that's applied to the actual lighting power calculation that allows the permanent applicant to count fewer installed watts towards his overall allowed. And the net result is that these watts are often used elsewhere in the building where more lighting is needed, or occasionally in some circumstances can be traded off against other energy features for the performance method.

Okay, next slide.

And here are the mechanics of how the credit works. If you look at column B, it's where you describe the lighting control description. If you had an occupancy sensor, for instance, under the current code, you would list it there. And then column G is where you list the watts of controlled lighting. That's, you know, the luminaires times the lamps that are controlled and the watts of those lamps.

And then the adjustment factor, which is a percentage and currently it's 20 percent for occupancy sensors, I believe, and then you just multiply G times H to get your control credit watts.

Next slide, please.

And then these watts are subtracted from your actual lighting power wattage on the

LTG2 form, and you'll see that box for that at the very -- next to the bottom, where it says less control credit watts.

And this is a mechanism that's been used, it's had its proponents and opponents. The trend has been to not use it unless there is no other option, and there are some benefits to it, though.

Next slide, please.

One of the benefits is that it can increase the acceptance of a technology that's not currently used as a standard practice; in other words, if there's something new the designers haven't completely embraced yet, this kind of control credit can encourage them looking at it as an option.

And credits are conservative. There is no net energy loss with credits, and actual energy savings is actually likely, because the credits themselves are relatively conservative to what the energy savings is in a particular space.

It does provide, preserve actually, the design flexibility for the lighting designer, and it can also act as a trial balloon or the first phase of a mandatory requirement. In other words, if it's accepted it can become a mandatory requirement the next round of standards.

Okay. Next slide, please.

And the three space types that we're looking at are kind of unique, and that's one of the reasons why we're looking at power adjustment factors instead of mandatory measures. And these credits should be used where multiple design scenarios may occur, and I'll give you an example of a library where we're proposing providing a power adjustment factor credit for library stack areas. And depending on the design of the library, the ambiance of the library, since it's a public space, the owner or designer might feel it's distracting for certain stacks to be going off and on in view of others who are trying to study or read.

There are other cases where we couldn't really prove cost effectiveness to the degree required to make it a mandatory measure, or we didn't have the data to support the analysis that would be required to back up, make it a mandatory measure. And there are other cases where we did look at certain worst-case conditions, like very short corridor lengths where it was not cost effective. And yet, if you look at overall corridor length within the building, it would still in most cases make sense to put that in, but under the worst-case condition it did not.

Okay, next slide, please.

So what are we proposing? For corridors of hotels, motels, and high-rise residential, we're proposing to provide a 25-percent control credit when automatic bi-level controls are put into place. And if you recall right now, corridors are exempt from bi-level circuiting, and so what would happen is the designers would put in bi-level circuiting, and then 50 percent or one of those circuits would be on an automatic occupancy sensor.

So the minimum light level in the corridor level would be 50 percent of design, and then when the corridor was occupied, the sensor would turn on the other half a light, so 100 percent of the space would be occupied at that time.

Okay. Next slide, please.

And our data showed that there is a high portion of a 24-hour day that corridors are unoccupied, and as I just stated, the sensor controls only half the lights. Egress lighting would always be maintained. And we're also proposing that these controls fail in the on condition rather than in the off condition, so if the control failed, there would be 100 percent light in the space. And it's cost effective in all but very short corridor segments, because of the view of the occupancy sensor itself.

This is showing two typical ways that this would work. The A lamps, either based on a luminaire switching or based on lamp switching, would always be on. And then when the corridor was occupied, the B lamps would come on.

Okay, next.

And here is what we're estimating for savings for corridors. During the day, in the yellow it's less, only around 12 percent, because they're typically occupied more during that time. At night, the savings go way up dramatically, and then the average is around 25 percent savings. And that is of connected lighting load. So the Y axis is a percentage of connected lighting load.

Okay, that's corridors, and then the next area is stack areas within libraries. And we're proposing a 25-percent control credit there too, but the requirements are a little bit simpler and a little bit more flexible, actually.

Some design scenarios you could turn off 100 percent of the lights in the stack areas as opposed to 50, so the designer could choose to have 50 percent of the lights controlled or 100 percent of the lights controlled, and the designer could also choose to have the mechanism be a simple time switch where at the end of the stack, the person would go turn on the lights before they entered the stack or it could be automatically controlled by an occupancy sensor. And one requirement we do have is that the sensor cannot control more than two aisles, or the time switch cannot control more than two aisles.

Okay. Next slide, please.

And we're proposing a similar credit for commercial and industrial storage stack areas as well. The credit would be somewhat less because the savings don't show to be quite as great. Again, 50 to 100 percent of the lights could be controlled, and you could use an automatic control or a timed switch. And again, the aisle restriction is there; no more than two aisles of the stack.

Okay. Next slide, please.

Okay. Why are we proposing libraries and stack areas get a power adjustment factor when these controls are in place? Because these are, again, frequently unoccupied during normal business hours, and the occupancy periods are typically quite short. And the space configuration, the narrow space, lends itself to occupancy sensing quite nicely.

Next, please.

And then, again, here is how it would work. The stacks are the wide, are shown as the wide -- they look like wide walls there, but they're actually supposed to be library and warehouse stacks, and this same configuration applies. You have A lamps or fixtures and B lamps or fixtures, and they would be controlled.

But either, in this case, the A and the B can be controlled by the timer or the occupancy sensor or, as an alternate, the A lamps or the B lamps could be controlled individually.

MR. AHMED: I have a quick question on this diagram.

MS. BENNINGFIELD: Yes?

MR. AHMED: Where would you put the

occupancy sensor for this sort of a stack? This is for a library stack, right?

MS. BENNINGFIELD: Yes, that's a good question. It depends on the sensor, but what are we showing? Ceiling mounted?

I'm sorry, this is Abhijeet Pande, and he did some of the technical analysis to support this proposal.

MR. PANDE: We basically used two types of ceiling sensors. One is a bi-directional sensor, so it senses both sides of the aisle, and one is a uni-directional, which is going to be at the end of the aisle.

MR. AHMED: The reason I wonder is that in some libraries the ceiling height is much higher than the stack, and even if it shuts it off, activity in the next aisle could trigger it on, so that's why I thought about that.

MS. BENNINGFIELD: Right, and that's another good case for making it a controlled credit rather than a mandatory requirement, because we don't want to intrude into the design.

MR. AHMED: Okay.

MS. BENNINGFIELD: Okay. Estimated savings for stacks: Currently they are, these spaces are required to be a two-level switch, so the savings between the manual and the two-level is already basically happening with current requirements. So our projected savings is the difference between the two-level switching bar and the occupancy sensing or manual on-timer switch sensing bar, which equates to about 25 percent.

And I did take this graphic from the Design Lights Consortium, but it's actually -- these are the same numbers that we did in our independent analysis and the outcome was the same, so I used their graphic.

Okay, next slide, please.

The third space up we're looking at is offices and classrooms, and we're proposing to provide a 20-percent controlled credit for small offices and classrooms that utilize either an automatic bi-level occupancy sensing control or a manual on bi-level occupancy sensing control.

And this is the case where in this space we're trying to discourage the flip both switches on as you enter the room type of habit, and so we can do that by having a manual on occupancy sensor, which only allows half the lights to come on, and then a separate action is required for the second set or the alternate set to come on, or the automatic on, which is only circuited to half the lights.

So you enter the room and you would automatically get half the lights. If that's not enough light, then you would have to call for the remainder of the lights. The purpose is, oh, and I just went over that, to discourage occupants from defaulting to the always-on mode of operation.

We're limiting the credit to small offices, 250 square foot is the size that's used in the code now, and so that's the parameters we use. It's possible it could be enlarged somewhat and it's possible we could look at conference rooms as well, but right now that's our proposal, 250 square foot or less, but classrooms of any size.

Next slide, please.

Okay. This is how this would work, and I think I already described it. You were walking to the space, and either the A or B lamps would automatically come on or you would call for them to come on, and then a separate action is required to receive 100 percent of the light. And then, of course, since the occupancy sensor is in the space, you would have the benefit of having the automatic off during unoccupied periods, as opposed to the current requirement, which is a sweep control during off hours.

And dimmer controls wouldn't be eligible, because there was a separate proposal to provide a 25-percent for dimming ballasts and dimming fluorescent systems.

Next slide, please.

Here are our estimated savings for offices, and here I'm showing where the savings are coming from for offices. The first bar is the 50 percent function, and this is based on our estimates of ambient light in small office spaces and occupancy behavior in small office spaces.

And then the occupancy sensing function, which is the automatic off when the room is unoccupied, saves a greater share, and together total their savings is over 30 percent.

Okay, and the next slide just shows some types of sensors that could be used in the space. And that's the end of my presentation.

So do you have any questions?

CONTRACT MANAGER ALCORN: Thank you,

Lynn. Question?

MR. PENNINGTON: Yeah, I wanted to come back to Ahmed's question. For the stack situation, he was imagining a scenario where the roof was quite a bit higher than the top of the stack, and the question was where you would locate the sensor. And I didn't hear the answer. Presumably, it's not at the roof line, but where would it be located?

MS. BENNINGFIELD: Do we have any control manufacturers? No, we don't have any.

We would have to draw up a few design scenarios, but I think our assumption was that we weren't looking at a very high ceiling, but in cases where we do, it's possible if there's a wall location to mount a sensor that would work; that would be an option.

MR. PENNINGTON: So the manufacturers have specifications for how close to the field that they're trying to control, it has to be right.

MS. BENNINGFIELD: Right, and they show the pattern of where the occupancy sensor would read.

MR. PENNINGTON: Are you still on the

line, Jeff?

No. This seems like an area that's ripe for acceptance requirements as well. And so, you know, I think you should work with Jeff.

MS. BENNINGFIELD: Yes, we are. We've read the acceptance requirements, and there are occupancy sensor requirements where during acceptance testing you would need to show that the sensor worked. So yes, it does tie into it.

MR. FERNSTROM: Gary Fernstrom, PG&E.

Just with regard to this particular question, there is no reason why the occupancy sensor couldn't be pendant-mounted or suspended from the ceiling to get its proximity closer to the top of the stack. So there are a lot of work-abounds to get these things to have a field of view consistent with what you want.

MR. AHMED: Yeah, I was wondering, the other alternative could be that you set a limitation from top of stack to the sensor, that it should not be -- you know, like limited, say, not more than five feet, something like that. That will limit it from being triggered off by the next aisle over, something like that, could we look into?

MS. BENNINGFIELD: Okay.

CONTRACT MANAGER ALCORN: Tom?

MR. TRIMBERGER: Lynn, you know, there are always two methods in getting people to do things. There's the carrot and the stick, and I just want to commend you for choosing the carrot with the power adjustment factors and lighting control credits. That's just so much more enforceable.

And I just wanted to encourage you to look at I think you had mentioned briefly conference rooms, but that's another good application where the usage is kind of limited.

MR. ELEY: Understanding that this is a credit, but have you thought about how this might work with high-intensity discharge lights, or would it not work in this case?

MS. BENNINGFIELD: Yes, we have looked into high-intensity discharge, and there are dimming --

MR. ELEY: Would you use a high-low ballast in that case?

MS. BENNINGFIELD: Yes.

MR. ELEY: All right. And then for classrooms, the CHIPS criteria recommends manual on automatic off, and for most classroom activities, either you're having class or you're not having class, and there's not much in between.

Do you think this makes sense or would you want to make the adjustments to it for the situation in the classroom? Where there's -- I mean, if you assume that the base case is manual on, automatic off, would these savings that you've shown still be the same or would they be lost, or would they exist at all?

MS. BENNINGFIELD: If I understand your question, you're looking for the difference between entering the space and calling for half the light or entering the space and automatically getting half the light?

MR. ELEY: Well, with manual on you would, if you enter the space the lights don't come on until you turn the switch.

MS. BENNINGFIELD: Right.

MR. ELEY: But they go off automatically.

MS. BENNINGFIELD: That's what we looked at initially. There is a group of -- There are very distinct, two different camps among control manufacturers as to whether manual on is the way to go or automatic on is the way to go, but the savings as we calculated it, were the same for manual on, automatic off, or automatic on, automatic off.

MR. ELEY: Okay.

MS. BENNINGFIELD: So we're treating them as equal.

CONTRACT MANAGER ALCORN: Okay. John Hogan?

MR. HOGAN: John Hogan, City of Seattle.

I wanted to make sure we had enough time to talk about the technical parts of this proposal. I wanted to back up and look at a little bigger picture here. I submitted several different proposals, some of which were linked to this, suggesting that all the power adjustment factors be deleted from section 146.

And I still think that's the right way to go in something which IES has done in their standard 90.1 as of 1999. The standards going to be out in 2005 are going to be eight years out and still out of sync with what the lighting designers are recommending be done here.

In terms of the controls themselves, I

think if things are reasonable to do that they should be required in the code, and you can discuss whether they're mandatory or prescriptive. I think all the controls requirements right now are mandatory measures, but there are a number of other requirements that are prescriptive. There's no reason why there couldn't be some controls requirements that were prescriptive.

The automatic controls requirements that are in there now generally deal with off hours, so there's the sweep control so, you know, the light is not wasted at night or weekends. But there is nothing in there to prevent this wastage during the day. This discussion here, this proposal is a way to get at some of that, but it seems there should be requirements for occupancy sensors in small offices, in conference rooms, classrooms. These are some requirements which we are enforcing in our code and so we recommend that.

We also think that automatic day lighting controls should be required too, as we require in our code. But it's time -- I think -- I'm sorry Tom's not here, but in contrast to his point, I think all these power adjustment factors make the code more complicated. They can make it more difficult for an inspector or plan reviewer.

It's much easier to go into a small office and say, well, it's got the occupancy sensor or it doesn't, you know, as opposed to figuring out, well, let's see, it's 1.2 if it didn't have the sensor, but it's 1.5 watts a square foot if it does have a sensor, I think that makes it more complicated.

So I would encourage your consideration of the proposal Lynn has made here, but more to consider it as a prescriptive measure or a mandatory measure, rather than as a power adjustment factor.

CONTRACT MANAGER ALCORN: Thank you, John.

Are there any rebuts or any additional comments on this topic?

MR. ELEY: I have one question maybe for John. I had a lot more questions, had this been a mandatory measure, but it seems like you would need to have some exceptions. I mean, anytime you make something mandatory, then you have to try and identify all the cases when you can't do it.

And furthermore, the requirements for cost effectiveness are much more important, and you have to look at sort of the worst case. So you probably have to factor in the high-low ballast as part of the cost of the measure in the case of the high day stacks and so forth.

So what would be the -- If this were to be a mandatory requirement, then we would have to identify a whole lot of exceptions, and where would you start in doing that?

MR. HOGAN: Yeah. I think there are some distinctions between the requirements we have in the Seattle Energy Code versus the ones that Lynn talked about. Our requirements are for occupancy sensors in offices less than 300 square feet, conference rooms, and classrooms. So it does not address stacks, you know, either in library or warehouses.

And so we don't think there's a lot of HID that's in small offices and classrooms or conference rooms.

Charles, you had one other point. You also talked about how the controls would work. We have a requirement that the occupancy sensors also have a manual off feature. Obviously, if you've got a perimeter office and lots of daylight, even if the sensor says you're there, you should be able to shut that off and say yeah, I'm here, but I don't want the light on.

And similarly, obviously, in conference rooms, a room like this, it doesn't matter, it's being read that you're here. You want to be able to turn it off for slide presentations and stuff, so that would make those work.

But I think in those cases there was an issue with the HID that you talked about. For our automatic day lighting requirements, we do have some exceptions for HID fixtures.

MR. ELEY: Okay.

MS. BENNINGFIELD: And, to clarify, we are requesting that they have a manual off feature too, the occupancy sensors.

CONTRACT MANAGER ALCORN: Okay, thank you. Any more comments? Noah?

MR. HOROWITZ: Lynn, if I understand it right, this is going the way it's currently proposed, with the power adjustment factor, we're not necessarily going to get any net savings from 2005 to the next round of standards; what they hope is people will be encouraged to try the technology, and if it goes well, then the next round of standards we might make it mandatory; is that your thinking going into this?

MS. BENNINGFIELD: Yes.

MR. HOROWITZ: Then the question I have is, do we need to allow one-to-one credit or do we say 75 percent of that credit so we get some net savings out of this?

MS. BENNINGFIELD: Well, if you read the --

MR. HOROWITZ: Have my cake and eat it with ice cream.

MS. BENNINGFIELD: Yeah. Well, in the report, actually the savings that we're estimating are about double what the credit that we're proposing is.

MR. HOROWITZ: So you did that implicitly by having very conservative savings.

MS. BENNINGFIELD: Yeah.

MR. HOROWITZ: Okay.

MS. BENNINGFIELD: Well, a very conservative credit.

MR. HOROWITZ: Right.

MS. BENNINGFIELD: I mean, we did estimate the savings fairly conservatively, but we, then again, cut the credit to be just enough, balance it against what you think it might take to get the feature installed, what -- you know, how big the carrot would need to be but still retain some of the energy savings.

So I'm very confident that this will save, and that energy would not save as much, obviously, as if it was mandatory.

MR. HOROWITZ: Okay. I'll stop the food analogies, as we're all suffering at this point.

(Laughter.)

CONTRACT MANAGER ALCORN: Okay. Gary Fernstrom, did you have a comment? No?

Okay. Any more comments?

Seeing none, hearing none, Lynn, thank you very much for your presentation.

MS. BENNINGFIELD: Thank you.

CONTRACT MANAGER ALCORN: Our last presenter, Jim Benya, is supposed to be calling in here in the next minute or so. So if you could just bear with a few more minutes of wait until Jim calls in, and we'll get started on the last topic. Thank you.

(Brief recess.)

CONTRACT MANAGER ALCORN: And then for our last presentation, okay, Jim are you with us?

MR. BENYA [via telephone]: I'm here.

CONTRACT MANAGER ALCORN: Okay. We're going to start the last topic now. It's called revised tailored method for allowed lighting power, and Jim Benya will be doing the presentation remotely.

Jim, you can start up whenever. We have a person on the Powerpoint podium that can advance the slides for you.

MR. BENYA: Well, you're going to have to help me a little bit and tell me which slide we're on, because I'm sitting in a car on Interstate 95.

CONTRACT MANAGER ALCORN: Okay.

(Laughter.)

CONTRACT MANAGER ALCORN: Well, we're on your, I think it's the first slide called Background.

MR. BENYA: Okay.

MR. ELEY: Jim, maybe you should pull over.

CONTRACT MANAGER ALCORN: Yeah.

MR. BENYA: Well, the background, the

purpose of this slide really was to explain to everyone that the tailoring method is probably one of the -- from a lighting standpoint, one of the best things about the standard. It's allowed us to maintain energy-efficient design, regardless of the really unique characteristics of a project. And it's been especially beneficial to retail lighting. And needless to say, that's a very significant part of our commerce.

So what we did look at, however, was the standard -- since it was originally conceived, it had to be modified with a number of very interesting and unique rules, it had to be created to somehow get our arms around what are the limits and how can they be properly applied.

Well, to make a long story short, after a number of modifications and other unique rules, it sort of becomes a little bit unwieldy in the permitting process. And we felt that by simplifying the rules, we could reduce the amount of documentation that was necessary.

So this is where we're at, is trying to take a good standard and make it a little bit better.

Could we change the slide, please, and

tell me what it says.

MR. ELEY: Proposal for Revision.

MR. BENYA: I'm sorry, could you repeat that?

MR. ELEY: This is called Proposal for Revision, this slide.

MR. BENYA: Okay. What we're proposing to do is take the slide as it -- or take the standard as it is, and modify the standard so that we break it down into its basic components. And, you know, I'm at a point I'm going to have to sit still and turn my computer on and actually follow along. But the basic components are the general lighting allowance plus specific lighting allowances over and above the general lighting allowance is the way that we can proceed.

It is, again, primarily for those unique lighting situations, such as retail, where we need to basically say, okay, here is enough light to provide general illumination for the space, but for those unique lighting situations where you need more light, we're going to give you certain allowances. We're only going to give you just enough to do exactly what you need to do. We're not going to give you any more than that.

I don't know if I'm explaining this well enough yet, because I'm booting my computer here in the car. Don't worry, I'm not driving.

MR. ELEY: Okay, good. Jim, the next slide has your equation for LPD total equals LPD general plus wall display, feature display, chandelier, and very valuable.

MR. BENYA: Thank you. Now, this slide illustrates how this will go together. We've always done this, but I want to stress that this improved version is very, very similar to the earlier version, but it makes two or three key differences that make it easier for us to apply the standard on an everyday basis.

If you can bear with me about ten more seconds, my computer is going to be done and I can get on with this here. I'm just about there.

MR. FERNSTROM: Jim, this is Gary from PG&E. Are you sure your automobile has a big enough alternator to handle the electrical demand you're placing on it?

(Laughter.)

MR. BENYA: Oh, I don't know, Gary.

I wish I could explain to you guys how awkward this is -- Okay, I got it running now, here we go.

All right. Let's move on to the next slide because I think that's relatively self-explanatory. When the original sealing method was devised, it was -- we figured out that if we were to provide use-it-or-lose-it allowances, use-it-or-lose-it allowances can't be traded off against any other space or any other lighting. You know, if you have an allowance of one watt per square foot for something, you use the lowest of one watt per square foot or what you actually do.

Use-it-or-lose-it allowances are in this reconfiguration available for four things: wall display lighting; feature display lighting, which could also be interpreted to mean floor display lighting, if you will; valuable display, which is really pretty specifically limited to jewelry and things like that; and ornamental lighting.

Next slide, please.

The proposed standard is conceptually similar to the current standard, because number one, it has a similar base allowance. I want to give Mazi a lot of credit for doing a lot of work on this, and he ran all the numbers comparing the draft of the standard as we were composing it to the current standard. It has a similar base allowance, it has similar use-it-or-lose-it allowances, and it has similar rules and restrictions, either actually or effectively.

But what it simplifies in a number of ways is really important. First thing it does is it uses table 1-N in the category table to set the base allowance. This simplifies the process and makes these numbers the same from table to table.

The second thing it does is in the current standard we have two different types of world lighting allowances, which was somewhat confusing. We've eliminated that and created one aggregate world power lighting allowance.

The third thing it does is it simplifies the display power calculations. Previously, it required the demonstration using plans and DKO of the amount of display area, and we've been able to simplify that to a process we believe is going to get consistent results with what we've done in the past.

And finally, it changes table 1-T to make it clearer and more easily applied and repeatable from project to project.

Next slide, please.

In arriving at wall allowances, we determined a new means of setting values. And what we did is I took from some recent project work in Southern California and broke the lighting down visually for purposes of explaining it into two components; that is, the vertical service illumination component, which is needed to actually illuminate the space of displays on the wall and they are presented to the viewer, and then valance lighting, which is what provides illumination to compensate for niches, cubbyholes, or just to get some light on the immediately adjacent ceiling.

And this works with a number of different types of retail display lighting very, very well. And again, it is based on current design techniques, and I think that's one of the strengths.

The next slide, please.

We show the computer modeling that I did in lumen micro. The intent here was to demonstrate that we could provide 50 vertical footcandles of illumination fairly evenly and what the wattage would take to do that. It turns out, using halogen infrared technology, as this slide illustrates, it takes 60-watt halogen IR lamps, approximately three feet on the center, or about 20 watts per lineal foot, to uniformly light a vertical plane in the perimeter of an area.

Next slide, please.

The next slide illustrates how a valance light is used. Valances do not light the front edge of the objects on display, but rather, they light niches and cubbyholes, and they produce brightness to draw your eye to the back of the store or into the niche. And in this case I used the recently completed Nike project in Southern California to show how T-5 lighting systems were used on two levels to produce illumination within this niche, in addition to the vertical surface illumination.

This is about as low as you can go with energy and still do an appropriate job of fully illuminating a shelved display unit. And so I felt this was an excellent model in which the T-bar technology at two-level requires about 15 watts per lineal foot of perimeter. When you add the two together to get total illumination, we go back to 35 watts per lineal foot of perimeter.

Next slide, please.

We then applied what we believed were representative of specific allowances or area of wall that would be permitted the perimeter of a total space in each of the different space types listed in table 1-N. For example, retail, which is one of the highest percentages, we set at 70 percent, based on several current projects that we've -- 70 percent seems the maximum useable wall area we could really come up with.

Other spaces we took values that, again, I think are representative of the amount of area that is typically used for retail-type displays, vertical surface displays, laid out air facility type, retail banking, specific facility, etc. So each one of these, we said 35 watts per lineal foot of perimeter, and multiplied it times the percentage allowed of wall that would be useable to come up with an allowed maximum power density and watts per lineal foot, lineal foot as measured around the baseboard.

Next slide, please.

For floor displays -- that is feature displays or floor displays -- the object was to ensure that we could provide 50 vertical footcandles on four sides of a freestanding object with one wattage, and again, using a halogen IR lamp technology. And this modeling demonstrates that we provide pretty code-specific footcandles on each side of a typical display object that you might have in a store using, again, a 60-watt lamp for each of the four luminaires you see lighting that object in the center.

Next slide, please.

We determined that the absolute maximum theoretical density of floor displays was about 28 percent, taking into account typical floor displays by a gondola that you might display clothing or other merchandise on. We multiplied that. We took into account also the necessary widths of aisles, given the universal accessibility and other factors.

The maximum theoretical density you could have in a store that has no main aisles or anything is about 28 percent of the floor area. However, we adjusted it downward ten percent for two reasons: Number one, because ten percent is the existing standard, and that was the maximum floor area that we could use, which is our number one reason for using it; but also, number two, it's a good common-sense value that corresponds well with recent design.

We used lumen micro modeling to demonstrate that at 28 percent density, to illuminate vertical surfaces to 50 footcandles as shown would take about 5 watts per square foot, so this allowed us to determine that at ten percent density that value would be 1.8 watts a square foot.

So we -- Now, using 1.8 watts a square foot as the maximum allowable display, feature display or floor display, lighting power density, and that would be for retail stores and museums, and other facilities would get lesser amounts based on the value that correspond to the actual use.

Next slide, please.

This is illustrating the new table 1-P. Table 1-P uses the same primary function space as in column one in table 1-N. Column two is the allowed wall display power in watts per lineal foot, as it is measured around the perimeter of the space. This particular column significantly improved, we believe, the repeatability and simplicity of people doing compliance documentation.

You'll note that some spaces are not permitted in wall display power allowance, such as the first one, an auditorium, is not. The third column allows a feature display power, again, the same thing and you'll see very similarly an auditorium is not provided with feature display lighting power.

The fourth column is whether ornamental lighting is allowed or not, yes or no. Again, some spaces we feel allowing decorative ornamental lighting increases the potential for designing appropriately styled spaces, it's consistent with Title 24's history, and so, therefore, some spaces, as before, are allowed that.

Finally, there's a call for a lot of very valuable display lighting. This is generally limited to retail sales, such as very valuable merchandise, china or jewelry. It's also limited to museums for those applications as well.

Next slide, please.

Something else that had to be in the revision. The IESNA changed its illuminative category between the eighth handbook and the ninth edition handbook which is now the standard handbook for the IESNA. And one of the things this did is it changed the categories F, G, and so on.

What we've done here is recalculated allowances for these categories, F, E, and G. We've done it using the 55-mean lumen for watt source. So what we're saying here is that we believe that there are higher efficacy sources that can be used to produce higher illumination levels in these categories when needed. Again, this has got to be done for three different RCR groups, and the coefficients of utilization were chosen from the averages of several different types of commercial luminaires and the different coefficients from the different RCRs.

Next slide, please.

We then continued table 1-R, but we modified how we are using the table a little bit. Previously, this table was meant to adjust simply lighting power densities for very high ceilings. And for -- What we've done is we've made it apply to all writing systems in these cases, except for the general illumination.

Slide, please.

Finally, this is a revised table 1-F.

We updated all of the lighting power density numbers here to correspond to this table. They have lighting values that were used in the other building area category and whole building method work that we did a couple of months ago, so these are all dated values and this is a revised list corresponding to the current IESNA ninth edition handbook.

Next slide, please.

Conclusions of the team: Number one, we updated the LPD values so that all the LPD values are consistent with all the other revisions we're making for the 2005 standards, and with the weighted reasonable cost effective technology.

Two, and this is a very important point: We embrace halogen IR technology for destroying consideration of real life-cycle retail stores. This is a question that's been relayed a couple of times. Why aren't we basing these standards on ceramic metal halide technology? And the reason is, is because ceramic metal halide technology does not actually pay for itself within roughly the seven to ten years, at the approximate break point where this technology has broken even.

And we believe that most retail stores

do not have a life cycle of a particular installation, a particular design that was going to correspond to that. In other words, retail stores turn over a little bit too often for this to be a consistently good choice. So this is a very rational decision, we feel, in favor of the reality of the retail industry.

This standard does significantly simplify wall lighting power allowance. It does provide the same net power allowance as the current standard, adjusted for new technology. Again, both Mazi and I produced calculations and we agree that if we were just to have made in the current standard changes to the new technology, the results you would get one way or the other would be the same. And, of course, it is updated to match the latest IESNA lighting handbook.

And that's the end of my slides, so I guess it's time for questions.

CONTRACT MANAGER ALCORN: Thank you, Jim.

Any questions or comments? Okay, Gary Farber has a question, Jim.

MR. FARBER: Hello, Jim.

The question that just occurred to me

that we had talked about earlier was the idea of combining the vertical wall illumination and the valance together, I believe that's what you did to come up with the total wall power, lighting power?

MR. BENYA: Correct.

MR. FARBER: Your example seemed to show the valance lighting not being used in combination with the wall illumination. Is that fairly typical, to have them both together, or are we possible double-counting here?

MR. BENYA: No, you just can't see the wall illumination in the sample. It's there, believe me.

MR. FARBER: Okay.

MR. BENYA: As a matter of fact, they used exactly that one too.

MR. FARBER: So you typically have -- Your niches that are valance-lit, they would typically have directional lighting from the ceiling also on them?

MR. BENYA: That's correct.

MR. FARBER: Okay.

MR. BENYA: You just can't see -- maybe you can't see it.

MR. PENNINGTON: It seems like on this

particular example that -- I don't know if you can get back to that slide --

MR. ELEY: It's called Valance.

MR. PENNINGTON: That one? That you're maybe lighting the vertical surface of the display with the -- you know, the valance lighting is lighting the architectural feature there, if you will. And lighting the vertical surface of the display, in addition to that.

MR. BENYA: Well, there is a track that is lighting the vertical surfaces above the clothing, in other words, that may be difficult to see, but it is there, and it employs a 60-watt lamp about three feet on center.

MR. AHMED: I think it's the one in the corner, right, Jim?

MR. BENYA: I'm sorry?

MR. AHMED: It's along the wall in the corner.

MR. ELEY: These are the 60-watt lamps he's talking about.

MR. PENNINGTON: Right.

MR. AHMED: Okay.

MR. BENYA: Plus being there, you know, this is a design we did where I focused the light right at the pictures, so I know it's there.

MR. AHMED: Okay.

MR. BENYA: You know, good lighting design sometimes you can't see all the lights. And that may be what's going on there, it may be the angle of the photo.

MR. FARBER: I've got several comments but no more questions. If someone else has questions, maybe they want to go first?

CONTRACT MANAGER ALCORN: Well, maybe we can take questions and then we'll get back to your comments.

MR. FERNSTROM: So, Jim, Gary Fernstrom from PG&E. I have two quick questions.

As I recall, the power requirement for T-5 lamps is about seven watts a foot or something like that. So you're using two T-5s in your soffit or display area lighting; is that correct?

MR. BENYA: Well, actually there are two shelves that are in that particular display, Gary. And so each one of them has a single E-5 lamp.

MR. FERNSTROM: Oh, I see. One is lower down and one is higher up, okay.

MR. BENYA: Correct.

MR. FERNSTROM: Okay, thank you. My second question has to do with your choice of halogen IR as opposed to ceramic metal halide, and you started to address the reason for that, but my question has to do with whether you evaluated that under time-dependent valuation or not.

These halogen IR heaters are on peak load and add nicely to the air conditioning load of the building, so it would seem to me, using a time-dependent valuation approach, you might find a lot quicker payback, and you might even find that using the 14-cent rate or so that typical commercial customers in California pay.

MR. BENYA: Actually, Gary, I did that very calculation on the very store you're looking at the pictures of. And we showed the simple payback period was about eight years, comparing halogen IR to ceramic metal halide.

And, you know, the client said, Nike said that's just a little bit too long for us.

MR. FERNSTROM: We've got to bring the cost of ceramic metal halide down, huh?

MR. BENYA: That's exactly what's got to happen. Right now you're looking at a ceramic metal halide track fixture lamp costing $125 to

$150, sometimes more. There's got to be an inexpensive one as compared against any halogen IR lamp and luminaire that's 20 bucks, lamp and everything.

MR. FERNSTROM: Okay. Thank you, Jim. You answered my question.

CONTRACT MANAGER ALCORN: John Hogan?

MR. HOGAN: Hi, Jim. John Hogan, City of Seattle. I have two questions also.

One, I think I understood you to say that as a result of all this, you ended up back at the same place that we are right now, but you think it's simpler to work with. And is that true? I'm surprised. Why would you end up at the same place when the lighting committee from 90.1 just recommended significant revisions and reductions to lighting power allowances based on the new IES criteria? And then said while you're thinking about that, what is the result? What are you estimating the watts per square foot, total watts per square foot would be for this for a typical retail space?

MR. BENYA: Well, there's a lot of -- Oh, boy. Number one, we did reduce the values on -- to take into account new technology. Keep in mind that in addition, 90.1 values have tended to be a little bit higher, in some cases a lot higher than in Title 24 for the last few years. So the combination, in fact, is I'm reasonably confident that when the 90.1 committee puts together its most updated version, they will probably pretty closely match where we're going to be here with Title 24. I don't know for sure, but I would guess they're probably going to be pretty close. Well, in other words, there is a reduction, it just isn't as profound as 90.1.

Secondly, what does the typical retail space run? There is no such thing as typical. Typical retail stores, you know, you can have a card shop or something with a minimum of display lighting. They can leave that at 1.5 watts per square foot, maybe even less. A big-box store you can do at 1.3, 1.4, as we've shown in the advanced lighting guidelines.

But once you get into the type of high-end merchandise display lighting that requires point sources, then it's a whole different ball game. Stores like the Nike store generally run anywhere from the high 2s to as much as 4 watts a square foot, and you might get all the way up to 5 with a jewelry store. So it really depends upon the merchandise as to what typical means.

But conversely, I don't think you can design a jewelry store for even less than about 5, even pulling every trick that I know to do it. So these numbers make sense to me, as a designer.

CONTRACT MANAGER ALCORN: Okay. Jon McHugh has a question?

MR. McHUGH: Yes. Jim, I'm looking at your -- Let me get closer here. I see that you've got a small display there and you're lighting it from all four sides, but a lot of times when we're looking in retail situations we're actually looking at long linear displays, and you're typically -- you know, on average, you're lighting up on two sides rather than four sides.

Why did you feel that it was appropriate to light this display, basically kind of take the worst possible case for your base calculation for floor display?

MR. BENYA: Good question. I think it's because I was really concerned about the verticals, and the vertical illumination is actually the most -- it's the biggest bugaboo and it's the reason why we put display lighting in.

MR. McHUGH: Well, I understand that, but it's still, in terms of, you know, a long linear two-sided display rather than this tiny little four-sided display.

MR. BENYA: Well, about the only thing I can say is that, number one, why did the proposed value, the store designs that we've been doing that have a mixture of displays. And, you know, a clothing store has got a lot of vertical stuff and it's not flat necessarily, there's a lot of hanging things, which are very difficult to light, because not only the aim but they create a lot of shadowing, and often they have shelves above them. Sometimes you have two tiers of vertical illumination in retail.

So to generalize and say that this is the most difficult situation, I'd say, well, no, actually it's probably about average. Because we do have two-tier situations, we do have gondolas with a feature display in the middle of them, we do have hanging coily displays and things.

So I'd say this is actually probably pretty average. And probably, most importantly, if we compared this number and this value that we've come up with with the previous standard, and it's very consistent with the maximum allowance from the previous version of the tailored method.

So a lot of things are going up here, Jon, and that's why Mazi and I felt this was a good way to go.

MR. McHUGH: Okay. Related to that, you come up with a calculation that really what you should be looking at is, you know, one of the issues in lighting design is that, you know, if you highlight everything, you haven't highlit anything, right? What you've ended up doing is using a low efficacy source to provide general lighting.

So you certainly want to have a situation where you're -- that when you're using your low efficacy source like halogen that you're putting light just on a few spaces and that it's relatively bright compared to your other spaces and you're using your high efficacy light source for general lighting.

Given that, you know, it appears that you're using a reasonable value that, well, okay, I'm going to light ten percent of my floor area with this low efficacy lighting that's providing highlighting. And my question is, is that you've done these graphs and you've showed that, you know, either a worst-case or, you know, given the two-tier argument that's maybe it's a moderate value that's 5 watts per square foot. But then my question is why are you not multiplying that 5 watts per square foot times ten percent rather than this 5 watts per square foot times ten percent divided by 28 percent? I didn't actually follow the math in this section here.

Do you see what I'm getting at, Jim?

MR. BENYA: Well, the reason why, Jon, is because the -- The first number, the 28 percent number, if I illuminated any of the vertical illumination we're looking for, vertical illumination being the dominant issue here, if I put the most possible, legal possible density of floor displays in the space, they would occupy 28 percent of the space, on the floor area. And if every one of them is illuminated in the manner shown in the model, then my power density for the entire state would be five percent, so 5 watts per square foot.

MR. McHUGH: Well, hold on a second, though, Jim. I thought that back when we looked back here earlier that you said that you were, that this -- for instance, this picture here where you've got -- where you have four 60-watt halogen IRs?

MR. BENYA: Yes.

MR. McHUGH: And how many square feet are you illuminating with basically 240 watts?

MR. BENYA: Well, we have a gondola area, and you have to pardon me, I don't have all this in front of me, but it's a gondola that's somewhere in the neighborhood of about four feet by four feet with an object in the middle of it, so in the typical clothing store situation, where you've got a table laid out, you've got clothes laid around the table in the middle of it, and you've got a step and you've got a mannequin, all right? The mannequin, you're trying to illuminate on each side both the mannequin and some portion of the laid-out clothing. So that's kind of the model.

And what we said is -- Now, if there are aisles all the way around it, you know, accessibility-complying aisles, what's the square footage that this is going to occupy if I lay out a whole space like this, okay? Keeping in mind you've got to be able to get around to the outside as well, and we computed that it would fill -- of gondolas you'd fill out about 28 percent of the space. So what we said, then, is okay.

Now, in the previous standard the equipment was ten percent. So we're here between 28 percent is the maximum theoretical, but ten percent is what the code has permitted previously. And we said that's right.

MR. McHUGH: Okay. I'm looking at your picture back here of your -- basically your four-foot-by-four-foot -- I assume that lower cube is four feet by four feet, and then that upper cube is, what, two feet by two feet or something like that, in your picture?

MR. BENYA: Probably, mm-hmm.

MR. McHUGH: Is that right? So what you're doing is -- And if you just looked at the footprint of that four feet by four feet, you got about 15 watts per square foot, and what you're saying is that my whole spill light around here is covering an area that's approximately three times that four foot by four foot, when you spread that out.

So what I think I'm hearing from you is that at this 5 watts per square foot, that's if I looked at that lumen micro picture and imagined that all of that floor area that is bright white, that that would be -- that if I'd used my halogen IR lighting to light the entire floor area of the store to that bright intensity with halogen, and what you're proposing is that perhaps what we should do is light, it looks like about one-third of the floor area, a little bit more than one-third of the floor area to that high intensity; is that a fair representation?

MR. BENYA: You mean floor display or you mean floor floor?

MR. McHUGH: Well, it looks like that 28 percent is if I pretty much just -- if I look at that picture of that box, right, there's a box, and then if you look at the floor area, it's essentially black or grey for most of it, and then there's a white area around that box. And that white area is pretty much your 5 watts per square foot.

MR. BENYA: Okay, yeah.

MR. McHUGH: Yeah? I mean, it's your model, and I'm just trying to understand what you're proposing here. Is what you're proposing that essentially 30 percent of the floor area is lit with basically the highlighting plus the spill light from the highlighting?

MR. BENYA: At 5 watts per square foot, you will produce adequate horizontal and vertical illumination to fill the floor area with the highest possible density of display gondolas, if you will.

MR. McHUGH: That's kind of the highlight everything approach would be at 28 percent we'd pretty much highlight everything.

MR. BENYA: Correct.

MR. McHUGH: And then we're backing off from that, saying that, well, no, we're actually going to highlight basically 40, or, what is it, 35 percent --

MR. BENYA: Ten/28ths, yeah.

MR. McHUGH: Well, the ten percent of 28 percent.

MR. BENYA: Yeah, you're correct.

MR. McHUGH: Do you feel that that's good lighting design, that that would be sort of the appropriate ratio, kind of it's a worst-case kind of situation? Is that what you're looking at there?

MR. BENYA: Absolutely. I believe that

this allows one, using halogen as a primary display light source, to fairly do the job. That's where we should be.

Gary Farber asked me a question on e-mail yesterday. He said what if we didn't have any other light source in there, would we have enough light? And the answer is no. At 1.8 watts per square watt of display lighting using halogen, plus adding the wall lighting, the space would still feel dark. But when you get to 1.8 watts per square foot with ceramic metal halide and you did it appropriately, you could light the space totally with that lighting system.

MR. McHUGH: And I assume that at that 5 watts per square foot back at your maximum theoretical density there, that you could light the entire space with halogen infrared, need no other light source at all, and you'd have plenty of light where the walls, the displays, just given the fact of, you know, just look at that lumen micro picture that there's, you know, spill light for the entire area around there that, you know, if you expanded that out so that you -- you know, that 16 square feet there was 28 percent of your total floor area.

MR. BENYA: Well, keep in mind that spill light in retail, because the light is so directional, you don't get all the benefits of interreflectivity as you would in, say, a more general lighting system in a more typical space. Retail is actually lots of small spaces from a coefficient utilization standpoint.

So, you know, to answer your question, yes, although I would like to amend that a little bit and say with the exception of the world, you would still not get the uniformity and the illumination levels on the walls unless you provide the wall lighting allowance that we talked about a few minutes ago.

MR. McHUGH: Okay. I won't keep us anymore. Thank you for helping me understand where you're coming from. Thanks.

MR. BENYA: Sure, Jon.

MR. FERNSTROM: Jim, it's Gary again. I'm chomping at the bit here. I'd like to revisit the economics of ceramic metal halide, and I just did a little calculation. I assumed that we replaced 150-watt halogen IR lamp with a 50-watt ceramic metal halide lamp. That saves 100 watts, and --

MR. BENYA: Won't work that way.

MR. FERNSTROM: How does it work, Jim?

MR. BENYA: It's about a two-to-one is all that you can get, in terms of mean being total power, a 39-watt ceramic metal halide is comparable to approximately an 80-watt halogen IR.

MR. FERNSTROM: Okay. So let's use your numbers two-to-one. In the 150-watt example, I'd be saving --

MR. BENYA: We don't need 150-watt lamps. So you have to start thinking about -- The appropriate size for most retail for this type of display is a 39-watt ceramic metal halide with ballast that's actually about 45 to 46 watts, and you're comparing it to an 80-watt halogen IR. That's a very fair comparison.

MR. FERNSTROM: So that's not even saving half.

MR. BENYA: I'm sorry?

MR. FERNSTROM: Thirty-nine watts compared to 80 watts.

MR. BENYA: Yeah, that's about right. You've got to real careful with ceramic, they don't have really good lumen maintenance, even with electronic ballast.

So, you know, all the manufacturers hype about these are great sources, but in my opinion it's about a two-to-one offset.

MR. FERNSTROM: All right. Let's assume for a moment it's a two-to-one offset, and let's assume hypothetically that we're going from 150 watts to 75 watts, just for the heck of it. I realize this doesn't line up with the size of the lamps in the pictures that you're talking about.

But I just did a little calculation based on store operation 12 hours a day, every day of the year, and it looks to me like that's going to generate about $40 to $45 of savings at 15 cents a kilowatt hour. And that would give us a slightly over three year payback on the incremental cost of the ceramic metal halide.

So I'm a little puzzled at even assuming the two-to-one relationship that you did, and how you get to a seven-or-eight-year payback.

MR. BENYA: Well --

MR. FERNSTROM: I think we ought to discuss this offline, but I'd just like to state on the record that my economic evaluation isn't even close to yours.

MR. BENYA: Well, probably the reason

why is when you take a 100-watt IR lamp -- pardon me, a 50-watt IR lamp which, by the way, doesn't exist, and you take a 75-watt, give or take, ceramic metal halide lamp, which kind of doesn't exist because of ballast and everything else, yeah, you're going to get the three, three-and-a-half, four-year number, but the problem is that the real lamps that you're going to compare them to, you're going to spend just as much money for the fixture, but you're going to only save half as much energy, Gary.

You start looking at -- Try doing the math with a 45 -- with what amounts to a 35-watt per luminaire, with the luminaire cost differential being $120, you'll find you're probably closer to six, seven years than you are to three, all those other things taken into account.

It's really critical that people understand that you can't use the 70-watt family of ceramic metal halides, because that's the equivalent of using roughly 150-watt HIR lamp which, a, doesn't exist, and b, we wouldn't use because it's too bright for most retail displays.

MR. FERNSTROM: Okay. I understand

where you're going with this. You're basically making the argument that these lamps and fixtures are smaller than I am assuming; therefore, the energy savings is smaller, but the cost remains essentially the same.

MR. BENYA: Correct.

MR. FERNSTROM: Okay, thank you.

Jim, Gary Farber has some comments.

MR. BENYA: Okay.

MR. FARBER: I've got another question based on what Jon McHugh was saying. Looking at this, for your feature display or floor display you've got 5 watts per square foot of display, that's what it's taking to light the display, and you're going to put the standard at 1.8 for the sales space. Isn't that 1.8 28 percent?

MR. BENYA: No. The 5 watts per square foot is assuming the display area plus the area around it -- In other words, something with a -- well, it's 28 percent of actual floor area is a display area. The 5 watts per square foot lights the display plus the floor.

MR. FARBER: Right, so that's how you derived the 1.8 is it's 28 percent of the 5 watts per square foot; is that right? No, it's not.

MR. BENYA: No, no --

MR. PENNINGTON: It's just a calculation that's shown there on the sheet.

MR. FARBER: Okay.

MR. PENNINGTON: The 5 watts per square foot, if I understand correctly, is representing displays occupying 28 percent of the floor area.

MR. BENYA: Correct.

MR. PENNINGTON: But the current criteria is having displays at ten percent of the floor area. So the 10/28ths is a calibration to get the calculation back to the current model.

MR. FARBER: Okay.

MR. PENNINGTON: And it just turns out that 10/28ths is not all that different from 28 percent.

MR. FARBER: Yeah, as I was looking at it, it looked like it was pretty --

MR. PENNINGTON: That's the circumstance.

MR. FARBER: Okay. Is it a good time for a few comments, then?

Let's see, first of all, on the question about the lamp source, I think Jim is saying that getting a payback to use the metal halide of about eight years, and I'm wondering, first of all, whether we have any data about the average retail space lifetime.

The second question is this would seem to imply, even if the average retail space lifetime was less than eight years, that those fixtures have no value at the end of the lifetime of that retail space, and I don't know that we ought to be assuming that at all. I think we need to look at how often those fixtures are used by the next tenant, and if they're often reused by the next tenant, then they still have some value.

MR. BENYA: Gary, that's a real good point. Let me -- Before I dive into that, let me just warn everybody that my cell phone battery is running down, and if I disappear, well, it was great talking to you.

(Laughter.)

MR. BENYA: That's a really good question. You know, I think the ceramic questions Gary Fernstrom is bringing up are important. Gary, you've asked this question very, very thoroughly via e-mail, and, you know, it's a tricky one. I admit it's a tricky one.

And, you know, I've asked myself the

question several times, are we ready to finally say now is the time we're going to tell retailers you're going to need ceramic or not? And I kept coming back to studies I did for Nike. This has been last year when utility rates were high, and I still couldn't quite pull it in. Now, that was using real-life prices, we had quotes from distributors, and I just couldn't bring it in for them. And they said it's just too long. We don't know if we're going to be there five years.

And the other thing is that sometimes, the fixtures that are left there might be used by the incoming tenant, but oftentimes they're discarded or moved somewhere else. And who knows if the tenant who paid for them ever enjoyed that benefit?

So, you know, I sort of said, yeah, I'm going to stick with the Nike analysis and say I think that's representative of the marketplace and what we ought to be doing. Well, that's where it's coming from.

MR. FARBER: Okay. I wish we had some more resources to study the marketplace a little more.

Second issue is the, using the area

category as a basic allowance, which is an idea I brought up last year and the response I got to using that is a basic allowance, and allowing a display allowance to be put on top of that is that the area allowance already has some small assumption of display lighting in it, and Jim and Mazi have both indicated that is true.

So I would like to see the display allowances deduct that whatever it is, .1 to .3 watts per square foot that is in the area allowance that's assumed for, other than the basic general lighting.

The third point is the four allowance -- Well, I guess there is some confusion in the language between what we're calling a feature display or a floor display, the description that Jim wrote talks about floor display, but then in that proposed language it's only called feature display. And I want to make sure that the feature display can't also be used for walls, and I'm pretty sure that is the intention of this, but I just want to make sure that that gets clarified, that the feature display is only for floor displays, and if that is actually true, why not just call it floor display allowance?

Now, the wall display credit, the proposed language at 146(b)(3)(d) is really not very clear about what the perimeter is. I wasn't clear as to whether it included glass walls or only opaque walls, and Jim has clarified that and said it includes the entire perimeter. I was wondering whether including a glass wall makes sense. And Jim has explained and I'm buying his argument that there is a need for lighting displays along the glass wall as well, although that's not exactly a wall display.

But I was wondering, my concern about having just this one entire perimeter number is that while it is a use-it-or-lose-it proposition and Jim said, you know, that you can't really do tradeoffs, in fact, you really still can do tradeoffs. And, in fact, in this case, when it's the entire perimeter, if you've only got wall displays on a couple of sides but you're getting a credit for four sides, well, you could just use less efficient sources or more of them on the sides where you've got your displays. So, in fact, you can really load it up and use an inappropriate amount of wattage for the displays.

And I think one way to address that is

to have a use-it-or-lose-it per wall length as opposed to just the total, and I think that would make it easier to plan review as well, if you said this length has this allowance and we've got this amount of display lighting along that length, and you get whichever is lower. And then you're not going to be able to borrow from other lengths.

MR. PENNINGTON: So let me see if I understand. You're proposing to have this be based only on the area that is designated for display, for the wall area that's designated for display and not for the whole perimeter.

MR. FARBER: Well, I didn't say each perimeter, use each perimeter separately rather than total --

MR. PENNINGTON: Well, I'm not sure what each perimeter --

MR. FARBER: No, not each perimeter, each leg, I'm sorry, each leg of the perimeter separately, as opposed to just combining it all into one total length.

MR. PENNINGTON: What does leg mean?

MR. FARBER: Length, what each --

MR. PENNINGTON: You said each leg. What --

MR. FARBER: Length or leg. Each length of -- You've got four -- Well, assuming it's a rectangle, you've got four different lengths, but if it's not a rectangle, you've got --

MR. BENYA: Could I interject something here? One of the reasons for coming up with the lineal footage thing, I have yet to see a retail store where walls aren't used for display, and this was primarily designed to minimize the need, to submit a bunch of plans showing the wall areas to be used for display, because, frankly, that's going to happen anyway.

What we're trying to do is make the standard simpler by saying we know that they're going to use walls in museums and in retail for display, and so we're going to discount them. That's the whole rationale here.

If you start breaking it down, then you're getting back into I've got to prove that I'm using for display. Well, that's sometimes easier said than done, to boot. What if someone wants to hang a bunch of pictures on the wall? Do they have to do a plan to have pictures on the wall? You run into those kinds of issues.

And we're just trying to illuminate that hassle. We know you're going to use the walls for display. Let's just give them to you and, you know, hopefully, the amount of abuse that will show up will be minor.

MR. FARBER: Right. I wasn't proposing that we actually base it on actual displays, like the current standards for wall feature displays, I was simply talking about having each length of wall have a separate use-it-or-lose-it, you know, standard as opposed to just doing the total store, as a way to reduce the gaming.

MR. PENNINGTON: I don't see what that accomplishes. I mean, if Jim is right that the whole perimeter is going to be used for a display, then you're just adding, you know, unnecessary detail to calculate it by lengths.

MR. FARBER: Right. Well, I guess what I had in mind was, like, a corner store so you have possibly two rather than four lengths of wall that can be all glass. And while Jim is saying there's going to be a lot of display there, they're actually not wall display as such, they're more the floor display.

MR. BENYA: Well, they're more like

wall display than they are floor, because they're vertical displays designed to be seen from outside rather than inside in most cases. So they end up actually behaving very much like walls.

MR. FARBER: Okay.

MR. BENYA: Not to mention the fact that they're usually in a very, very bright area so you need to have quite a bit of illumination there to compensate for the ambient light.

MR. FARBER: And you don't think there's enough allowance in the floor display to take care of floor displays -- or window displays?

MR. BENYA: Absolutely not. Window displays are the hardest thing in the world to do. And sometimes you can never have too much wattage in a window.

CONTRACT MANAGER ALCORN: I think Jon McHugh has a comment here.

MR. McHUGH: Yeah. I think Gary has got some good comments. I'd like to distill down I think the ones that I found myself agreeing with. First off is that this -- When we look at this calculation that the LPD for the space did include some display lighting in there, and so if either reducing down the other LPDs or reducing down that you take some fraction of the open space, you know, take 80 percent or whatever the appropriate base amount was when the LPDs were calculated originally for the whole space category or the area category method for that space, that that base amount be used for the general lighting that was used to develop the LPD.

Secondly, that, you know, looking at the example that you've shown for wall lighting, you're showing a wall being continuously illuminated to 50 footcandles with a low-efficacy source, I think it probably makes -- I mean, that's kind of your worst possible case. And again, the whole idea that highlighting is not just lighting everything evenly, that that's not highlighting, but probably something more reasonable like 50 percent, using this, you know, instead of 20 watts per linear foot, something like ten watts per linear foot for the entire perimeter area, but it's for these lamps that are by, you know, within X number of feet of that wall, you can't trade that to some other lamps if you indeed have those lamps by the wall that are going to comply or be part of this additional wall lighting credit.

But I think those two together would reduce by a fair amount the wattages that we're looking at and still yet provide designers the flexibility to provide, you know, one, good ambient lighting; two, a reasonable amount of wall lighting and display lighting.

Any comments, Jim?

MR. BENYA: Well, John, your first point about backing down a little bit from the general illumination, that makes a certain amount of sense. I'm not sure that I'm ready to accept your second point, though.

The way floors are designed and the way the demands that are being placed on certain store designs -- I'm not saying all stores but I'm saying certain stores -- in my opinion, that 20 watts per foot of vertical surface illumination is a necessary amount.

And additionally, you need to be able to light niches or get the light on the ceiling or something in that vicinity. And so either way, I'm going to stick to my guns I think for now on the vertical surface allowance.

MR. McHUGH: Well, let me just interject that, you know, as you pointed out, there are probably some stores that have some exceptional desires for having highlight levels along the entire perimeter of their walls. And at that point, does it not make sense that perhaps those stores, to get to that higher level, similarly in the past, you know, people basically purchased expensive controls to get the extra PAS. Well, maybe they need to purchase marginally cost-effective ceramic metal halide lights to get to those high light levels that they feel they need for these exceptional spaces.

MR. BENYA: Well, Jon, you know, it's an interesting point. I don't agree with it, but it certainly is, you know, one of the key issues; that's the reason why we have the session we're having. I don't think it's all that you do and, you know, in a way, it's up to all of us to reach consensus, certainly.

But I still think that you don't tell major retailers that you've got to install more expensive lighting, because you're using too much power. If you have, let's say, dark clothing, for example. Clothing absorbs illumination like crazy. When we look at typically light-colored clothing, there's 50 percent reflectance. When we consider dark-colored clothing, there's about three percent reflectance.

So, you know, I can't go along with it, because I've done so many clothing stores where you need every lumen you can get because of their tendency just to absorb light.

MR. McHUGH: Right. You know, the challenge is that, you know, the standards, to really create benefit for society, they really need to force a lighting designer to really sharpen their pencil to provide the aesthetic desire of the store and balance that yet against the societal need to reduce pollution and other economic problems from excessive energy consumption, and that's what this is all about.

MR. BENYA: Well, actually, it's all about whether or not it's cost effective, Jon. And if my argument is correct, and I'm maintaining that the life cycle of this particular type of lighting is not the same as that for other building sites, then my argument is technically correct from the standpoint of cost. If I'm wrong, and people feel strongly we should be using a longer life cycle, then you're right, we should be using ceramic metal halide.

And if we decide that, then it's as simple as that. I'm not passionate about it one way or the other. I just recommend we go with the shorter life cycle.

MR. McHUGH: The other challenge is that, of course, with lighting, it's almost that there is no cost effectiveness. Because, frankly, putting in less lighting fixtures all together is more cost effective, and less light, less energy consumption, less first cost.

And so the question is balancing how much light is, you know, to some extent, acceptable. I mean, that's, you know, some of the same things that we've dealt with in terms of lighting for offices and, you know, at one time people were lighting offices to 75 footcandles.

And I think it's fairly hard to say just because IES has these particular standards around selling things, that this is actually a task that needs 400 footcandles or 300 footcandles just because that's the way that we've sold jewelry in the past. It's not particularly a task requirement necessarily for some of these things that we're selling.

MR. BENYA: Jon, where you're going I

can't follow you. We need minimum IESNA recommendations. We taper them sometimes, but in general, we need them. And I don't agree that reducing the vertical surface illumination density for wall lighting recommended is needed, so I'm not going to go there with you.

I think your point about, you know, ceramic metal halide and about how companies should use it, that's absolutely true. But we're only lighting these walls to 50 vertical. We're not lighting them to 100 or 120. So if they want 100, they can go to ceramic and they can still do it.

But unless we decide that the life cycle of display lighting is longer than about seven or eight years, you know, I can't justify using the test that we're charged with using when we make these recommendations.

MR. McHUGH: Yeah, I hear you. I guess actually I have a question here for Charles, given his sort of history with the standards.

You know, historically we've used the 15-year life cycle cost as the basis for all the nonresidential standards, and, you know, Jim is suggesting that I think, you know, if you apply the discount rate, his eight-year payback probably comes out to something like 10 or 12 years, you know, after you've applied the discount rate to it.

What is sort of the historical position that has been taken in the standards, relative to retail lighting in the task?

MR. ELEY: Well, the lighting power density requirements have, the cost effectiveness of those has been based just on the cost effectiveness of various technologies, that we've always used these models and we've always relied on IESNA recommendations for illumination levels and other design criteria.

And the 15-year time horizon has been used since '92, I think, right? For nonresidential buildings, and we shifted to 30 years just for envelope measures, and that was with AB 970.

MR. McHUGH: What I'm hearing Jim is saying is that he wants to -- I mean, at least for his analysis, he's shifted to a shorter time horizon, based on his discussions with retailers that their turnover in spaces is less than 15 years.

MR. BENYA: Well, let me give you another practical thought. I have to really put two and two together here, but most retailers today are running 4- to 6,000 hours a year of operation on retail lighting systems, and if I were to take a ceramic metal halide luminaire and run it for 6,000 hours over eight years, I'd be pretty much approaching 50,000 hours, which is the rate of lighting for that electronic ballast. And I would be surprised if it lasts, you know, that long.

But pretty much at the end of eight years, you throw this fixture away, you guys, you throw this fixture away, it's not worth much at that point because of the power, okay?

MR. FERNSTROM: Jim, it's Gary from PG&E. I don't disagree with you on that one, but how many halogen IR lamps would you go through in that length of time?

MR. BENYA: Okay. Well, the halogen IR lamp is rated at 3,000 hours. It costs eight dollars. The ceramic metal halide lamp, you're going to replace it between, probably around 7,000 to 8,000 hours, and so even at 9,000 hours. Let's say you get three ceramic lamps, three halogen lamps for each ceramic lamp. The ceramic lamps right now cost about six times what the halogen infrared lamp costs.

So you're actually -- The ceramic lamps cost more in the life cycle than the halogen IR. That doesn't work in your favor.

MR. FERNSTROM: And you don't think that price would come down with greater demand for those products?

MR. BENYA: I don't know. I don't know. There is not evidence to suggest it's going to come down real far; otherwise, it would have happened already.

MR. FERNSTROM: Well, the price of compact fluorescent lamps has come down from $28 and $30 to $4 at Ikea.

MR. BENYA: Yeah, but that's a whole different ball game. There you're talking about the ballast and everything else. I'm just talking about the bulb itself. And the ceramic metal halide has been on the market for six, seven years. And yes, the price has come down a little bit, but there's no trend like that. The lamp is expensive to make.

MR. FERNSTROM: Yeah, and its

penetration in the market is pretty small. I suspect that cost would come down appreciably with greater sales volume.

MR. BENYA: Yeah, but the ballast price isn't coming down, Gary. That's part of the problem, these ballasts -- The ballast is a major part of the problem, and don't forget you have to have a pulse-rated socket, you know, and a few other things as well. By the time you go through all this, it's just an expensive proposition.

MR. FERNSTROM: Okay. Thanks, Jim.

CONTRACT MANAGER ALCORN: I want to -- This is Bryan. I want to interject at this time that I think we're going to lose our phone connection in about 12 minutes or so, or 12, forgive me -- Well, yeah, 12, 13 minutes. So I know Gary has got --

MR. ELEY: I think we've beat this horse to death anyway.

CONTRACT MANAGER ALCORN: Yeah, this particular line perhaps can go offline.

And Gary?

MR. FARBER: A quick question for Bill, what Jon was saying. Is the 15 years matter a law, or is there --

MR. PENNINGTON: No.

MR. FARBER: No.

MR. PENNINGTON: That's a decision the Commission needs to make.

MR. FARBER: I see, okay. So it made that decision back in '92 and it's continued --

MR. PENNINGTON: Yeah. As I recall, we were using a 15-year life before then too, but --

MR. ELEY: Yeah, I think that's right.

MR. FARBER: Okay.

MR. ELEY: I know for certain we started using it in '92.

MR. FARBER: I just had a couple other comments. I'm doing a large retail space right now and we're doing tailored, and the space has -- What is the space? Probably about 3- or 4,000 square feet. And it has a lot of display walls within the space, and these walls are not ceiling height.

And I believe the proposed language talked about perimeter plus full height, intermediate walls within the space as using that perimeter length. And Jim has said that full height means to the ceiling. And I'm wondering whether we need to get that strict, because some of these spaces may have a really high ceiling, you know, 10, 12, 14 feet. If you've got a seven-or-eight-foot display wall, and it's a permanent wall, so it's structurally attached to the floor, whether we shouldn't get a credit for that.

I know in some cases I'm arguing for less watts, but just to be fair, I'm wondering, you know, how picky we ought to be about what these walls within the space that will yield a wall display credit, so I don't know if Jim has a response to that or not.

CONTRACT MANAGER ALCORN: Jim, do you have a response to that?

UNIDENTIFIED SPEAKER: I think Jim is gone.

CONTRACT MANAGER ALCORN: Oh, we lost Jim. Oh, well.

(Beeping heard.)

CONTRACT MANAGER ALCORN: Hello, Jim?

MR. BENYA: Oh, I'm back.

CONTRACT MANAGER ALCORN: Oh, okay. Do you have a response?

(Laughter.)

MR. FARBER: Do you want me to repeat the question? Jim?

MR. BENYA: Yeah?

MR. FARBER: Did you hear my question about walls within the sales floor?

MR. BENYA: No, you were starting -- My cell phone dropped just about that time, so try again.

MR. FARBER: Okay. I was just talking about to be fair, to allow this perimeter credit for walls that are not ceiling height necessarily, that, you know, perhaps they need to be only seven feet high, something like that, and need to be structurally attached, not a freestanding just balanced wall, but actually structurally attached to the floor.

And the reason I bring that up is I just happen to have a current experience with a large floor plate retail space, and it's got a lot of these intermediate walls, you know, within the sales area. And, you know, without getting a wall printed, I guess they could get a credit -- I mean, they could use the floor display credit instead, because it's all just total numbers.

But that gets to my second question about the floor display credit, which is -- My concern -- I think you were answering Jon McHugh about this 1.8. My understanding is that for retail, the 1.8 floor display or feature display credit is additive to either the tailored general lighting or the area category general lighting, right? So the total would be a little over 3 watts a square foot.

MR. BENYA: Well, actually, it would be -- Yeah, it would be up to that, because remember, the allowance for the floor display or feature display is a use-it-or-lose-it.

MR. FARBER: Right, I understand. That was my point that I was discussing with you by e-mail is it wasn't based on the 1.8 but it was based on the total, over 3 watts a square foot, that there is nothing in the proposed standard other than the type of source, and I don't know actually how much that's going to be fixed in the standard, but at least your presentation talked about maybe limits on the type of source that could be deemed a display source in the use-it-or-lose-it calculation.

But I've done a lot of retail spaces where they just want to use display sources for all the lighting, and they just max out the use-it-or-lose-it. And I appreciate that this proposal has a limitation on the wall display lighting that has to be within four feet -- Is it four feet -- of the wall, but when it comes to the floor display, there's really no limitation other than the total watts.

And I was wondering whether it might make sense to have some type of maximum limit to ensure that we don't get stores that are based totally on inefficient source. In other words, say, that the watts that you use in the use-it-or-lose-it calculation cannot exceed perhaps 50 percent of the total sales area watts or something like that.

MR. BENYA: Well, again, I disagree, I disagree. You're imposing on retailers, then, a particular limitation with style and technique, that many of them will not like. And I don't think you're going to be -- Well, let's put it this way. What we're setting is a standard that is no different from the current standard, other than it's tweaked down a little bit so as to improve on some technology.

So it's very intentional that if someone wants to light the entire state with par 38 and track lighting, that they can do it as long as they stay within those allowances. But I disagree with you. I think doing that, that if they want to, they can.

MR. FARBER: Yeah. Well, that's what I'm afraid of, because now stores do it if they're willing to go through the tailored method. And that's a little bit of a hardship, but if they're willing to do that, they can get a large credit under use-it-or-lose-it and just put in a lot of these inefficient sources, and use it for general lighting as well as display lighting.

And this proposal is going to make it easier to do that. You're just going to get the 1.8 watts on top of the general allowance, and I'm afraid people are just going to come in there -- not everyone, but a lot might just put in all display lighting for the whole store. I do a lot of stores that way, so I've seen a lot of it, and this is just going to make it easier.

I understand the total watts per square foot, this is going to be a little bit lower than current, but that's going to be balanced against it being an easier standard.

So I think it's just something to consider, that we might see a greater number of stores with higher wattages because we're having an easier method. And that's not to argue against making it easier because I understand the current method is so difficult. People play all kinds of games with it and get away with murder with it.

So I'm not sure what the solution is, but that's why I'm just bringing up these ideas of possibly having some type of maximum limits.

MR. BENYA: Well, the thing is, is that I don't think you should look upon it as getting away with murder, because I don't think that's -- that's certainly not what we intended and it's certainly not what's happening.

They are being allowed relatively high lighting power densities because of the business that they're in and because of the importance of lighting in retail. Are they being allowed the 15 watts a square foot I see in New York? No. They're being allowed what we can barely generate legitimate support for, just barely.

So I don't think we should have a limit, I think we're fine, and I don't think we should try to -- Until we have slightly more cost-effective sources, I don't think we should try and tweak it down any further.

MR. FARBER: Okay.

CONTRACT MANAGER ALCORN: I think it might be a good idea to wrap up and have some offline discussion, continuing on this, before we get cut off by the phone service, if that's okay with everyone here.

MR. FARBER: Sure.

CONTRACT MANAGER ALCORN: Okay. I'd like to thank everyone for their input and participation today, especially those who hung around for the duration. A reminder again that the next workshop is going to be on August 8th.

So again, thanks very much and this meeting is adjourned.

(Thereupon, the meeting was adjourned at 5:13 p.m.)

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CERTIFICATE OF REPORTER

I, VALORIE PHILLIPS, an Electronic Reporter, do hereby certify that I am a disinterested person herein; that I recorded the foregoing California Energy Commission staff workshop; that it was thereafter transcribed into typewriting.

I further certify that I am not of counsel or attorney for any of the parties to said matter, nor in any way interested in outcome of said matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 25th day of July, 2002.